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In Light of Light The Secular Sacred in Architecture

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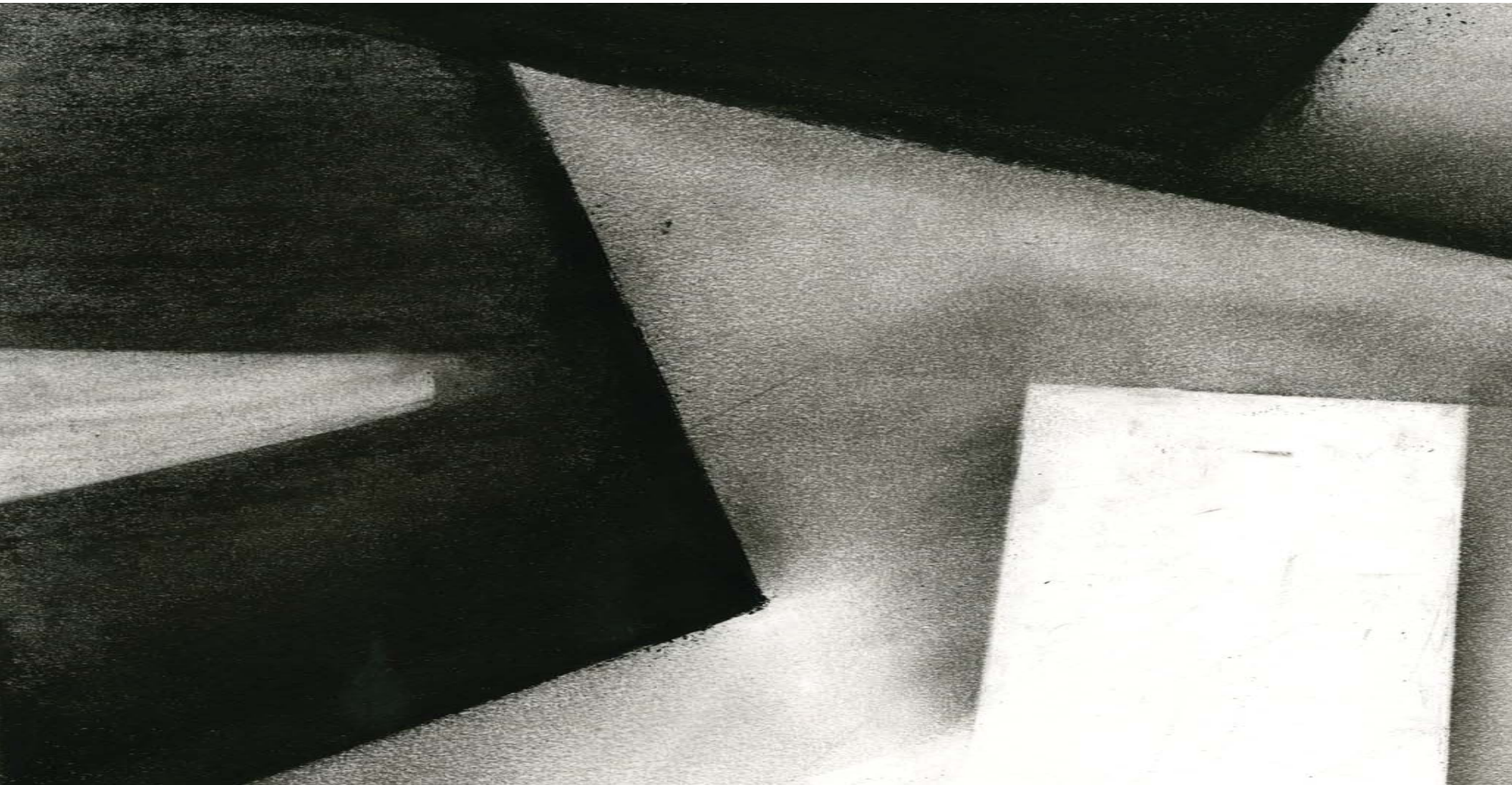
THE SECULAR SACRED IN ARCHITECTURE



IN LIGHT OF LIGHT

THE SECULAR SACRED IN ARCHITECTURE

Jazz Graves

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presented to the faculty of
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Major: Architecture
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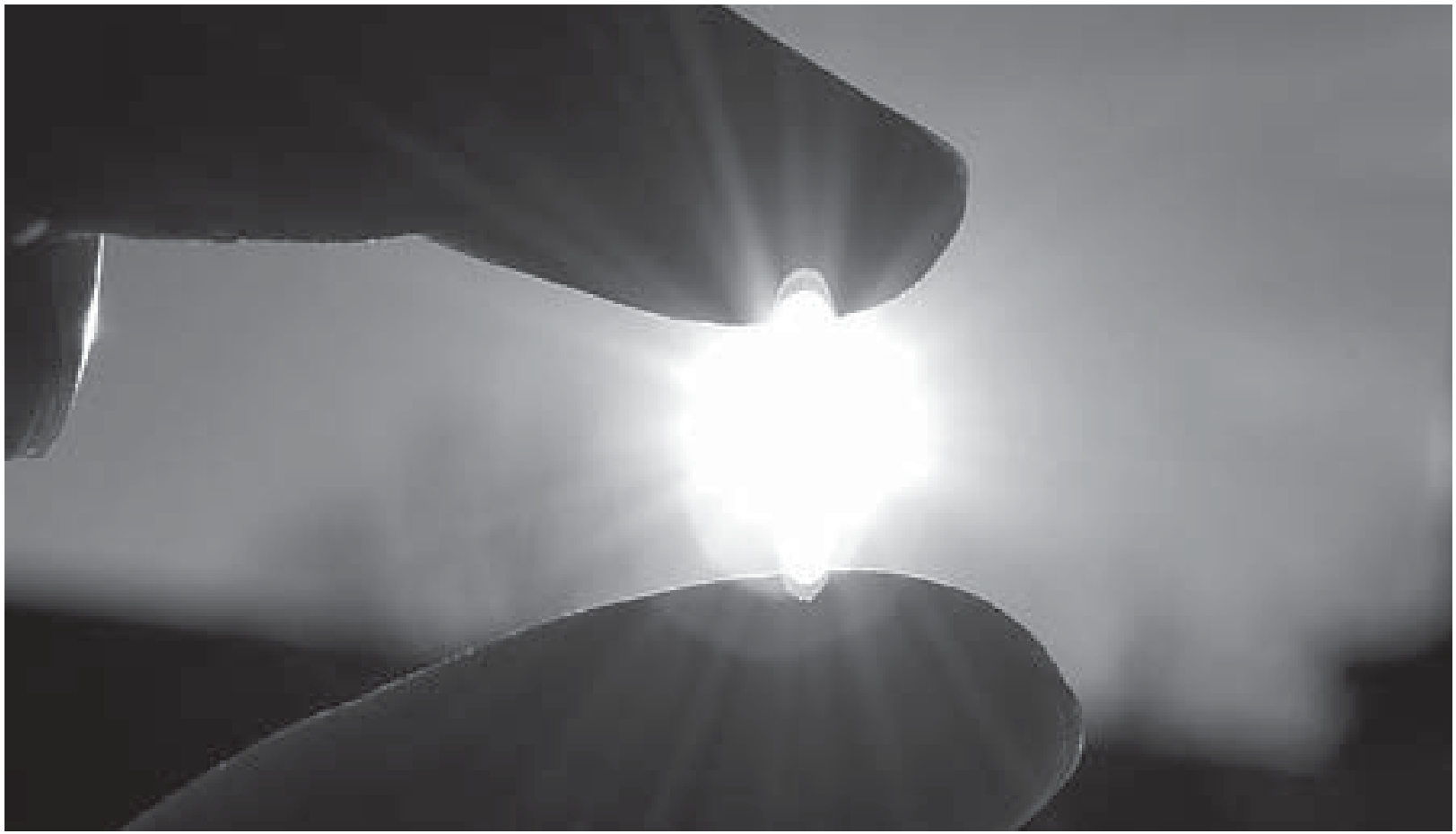


PREFACE

For purposes of my thesis I am dealing with daylighting specifically. As an essential building block of life, the implicit or explicit sense is that natural daylighting is always better than arfitcial electric light.

The radiation of man-made light lacks the tempo and wavaelength, nuance and tone necessary to replace a need for natural lighting.

There is a need for a deeper sensibility for light's role in design as it relates to understanding people in their totality.

INTRODUCTION

POLEMIC

Through exploration and observation, I've noticed environments that are banally lit and see this as a missed opportunity. These environments are not poorly or badly lit, rather they lack a discerning quality and appear generic.

Light's value is reduced to a measure of quantity, optimization and efficiency used primarily to flood and illuminate space. Ultimately, light's significance is diminished in uniform illumination.

INTENT

Humankind's fascination and experimentation with light is as old as the built environment itself. Consciously or unconsciously, architecture and light share a distinctive relationship. This has created rich situations in the past and it can create new ones in the future as well. To address the potential of this relationship in a design thesis, one must realize that there is a crucial difference between an objective description of light and what we perceive.

The measure of light can be quantitatively described in luminous flux, radiant energy, or even directionally in relation to time. This way of approaching light produces standard approaches to day-lighting based on design guidelines, energy strategies, and ultimately instrumentalization.

This approach is not worthless, however, it diminishes the full significance of light in design. The heterogeneous building requirements of our age cannot be met by standardized "one-sized-fits all" solutions.

As a critique and compliment to instrumental day-lighting research, which assess the performance only in terms of quantitative illuminance goals and glare-based discomfort, my thesis attempts to re-establish a fuller understanding of day-lighting. To do this, I look to elevate the experience of light in order to disclose understanding of a different nature. In other words, natural light is a dynamic and ephemeral tool for expressing the qualities of architectural space, forms, and materials. This relationship can underpin architectural thinking as a way to connect the significance of light with the making and inhabitation of spaces.

In short, the transformative powers of light stand at the threshold of vision and discovery. By looking carefully at the transformative properties of light in design, we may begin to realize the potential of light in both spatial and temporal variability. It supports our daily activities because we as humans evolved in the cyclical swing of day and night throughout the changes seasons and years.

There is also a need for a deeper sensi bility for light's role in design as it relates to understanding people in their totality.

Rather than employing generic and uncritical lighting strategies, we can look at buildings as domains of immaterial energies. To say this differently, by understanding our commodified world driven too frequently by control and optimization, this thesis wonders if the architect can re-animate architecture with a secular-sacred dimension through light.

The secular-sacred is an environment that initiates a profound and sensitized encounter of the self in the world. This is an event of singularity, which surpasses the sphere of the everyday by raising up moments and architecturally framed activities. This is a direct challenge to an instrumentalized architecture that fails to sustain the immaterial and ideal totality of our lives.

THESIS STATEMENT

In a commodified world, drive by control and optimization, the designer has the ablility to reanimate the physical with a **SECULAR SACRED** dimension.

Rather than employing generic, uniform lighting we can look at buildings/spaces as domains of immaterial energies of natural light.

Moving beyond the limits of a field defined by physical facts we can explore relationships of light and architecture that derive more from process than from a state.

the soul employs reverie to apprehend the poetic image

GASTON BACHELARD

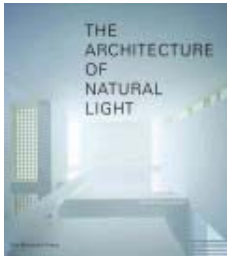
THE POETICS OF SPACE

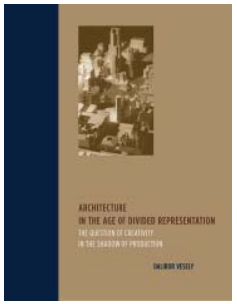
RESEARCH

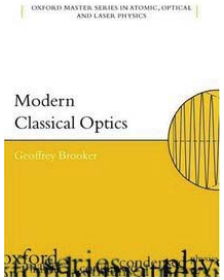
Research included a broad literature survey, from which I derived my own understanding of what light is, how it is understood and of great importance - how it is perceived. From there I made provisional conclusions for procedure and developed a model of the understanding of light over the centuries from which the frame work for my thesis grew.

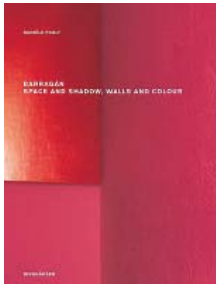
Additionally, I performed an exhaustive precedent study of buildings that have received acclaim for their use of daylight. From over 100 buildings I developed a taxonomy that led to a system of classification to further understand the way in which light was modulated, the aura that the incidental light created and the affects that lighting conditions had on program, namely procession through a building.

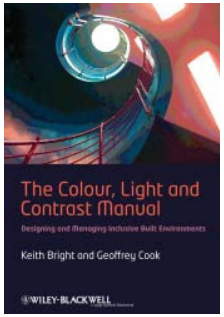
The Architecture of Natural Light
Architecture in the age of Divided Representation
Barragon : Space, Shadow and Coulor
Between Silence and Light
Building with Water
Constructing the Ineffable
Daylight Design of Buildings
Human Factors in Lighting
In Praise of Shadows
Kahn
Light and Emotions
Light and Gravity
Masters of Light
Modern Classical Optics
Nothingness: Tado Ando's Christian Sacred Space
Poetics of Architecture
Questions of Perception
Sunlighting as Formgiver for Architecture
The Air is Blue
The Architecture of Glass
The Color Light and Contrast Manual
The Eyes of Skin
The Opening of Vision
The Perception of Light and Color
The Poetics of Space
The Sacred and the Profane
The Religious Imagination in Modern and Contemporary Architecture

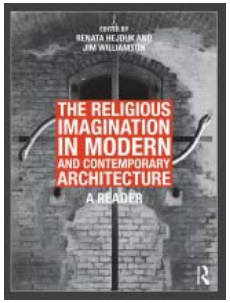


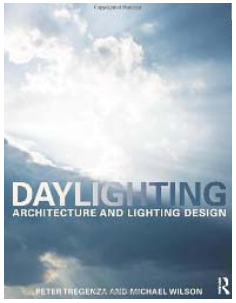


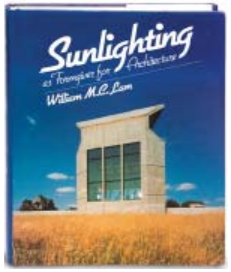


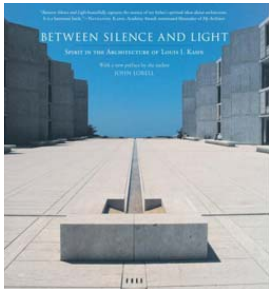








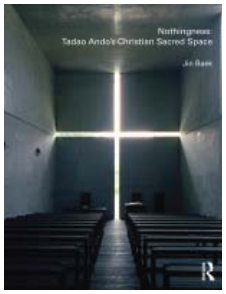


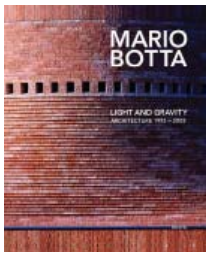


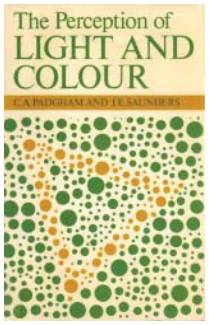
LITERATURESURVEY

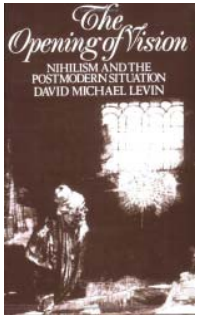
I began my research with a literature review on the topics of light, phenomenology, representation and perception. My references ranged from books related directly to architecture and light to the study of the perception, concepts of phenomenology, philosophy, physiology to the physics of light and modern optics.

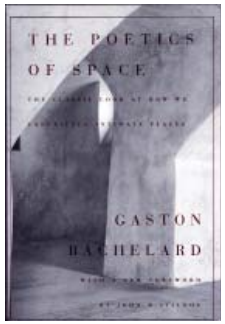
My goal was to engage light with a multifaceted approach to gain a better understanding of historical constructs, cultural significance, beliefs, perceptions, philosophy and understanding of light to challenge my own attitudes and assumptions and expand my grasp of the mechanisms of light. The broad spectrum of inquiry expanded my vocabulary and understanding of light to fuel a refined sense of judgment. Ultimately, the research helped me to challenge current approaches to treatment of light in architecture and to frame my argument and subsequent study and exploration.

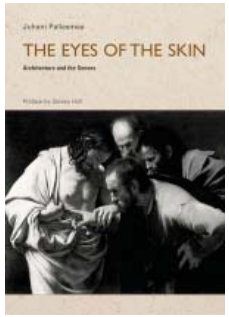


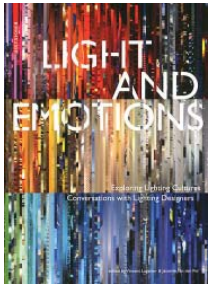


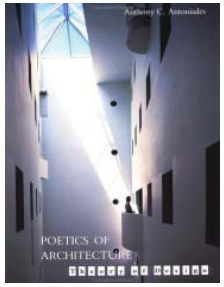


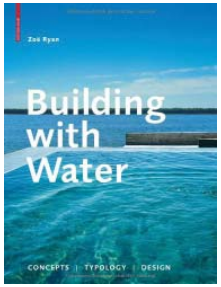


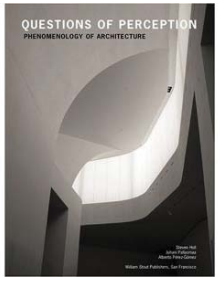


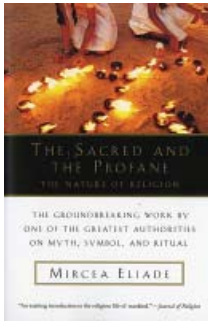


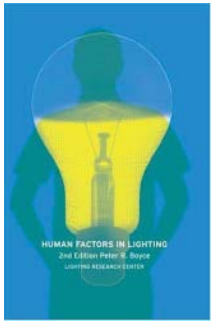


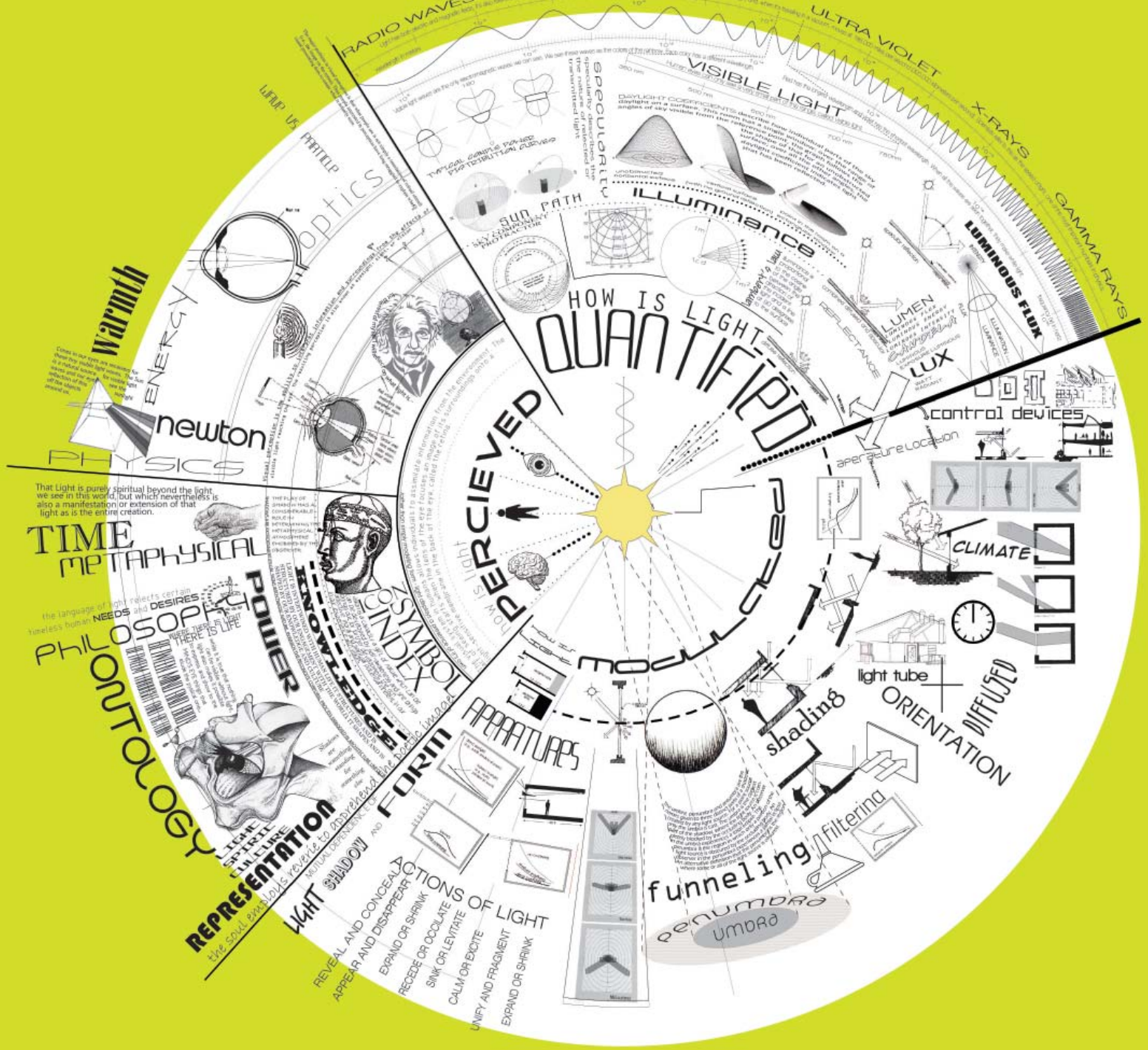











RADIO WAVES
MICROWAVES
INFRARED
VISIBLE LIGHT
ULTRA VIOLET
X-RAYS
GAMMA RAYS
HOW IS LIGHT
QUANTIFIED
PERCIEVED
MODULATED
ILLUMINANCE
LUMINOUS FLUX
LUX
LUMEN
REFLECTANCE
SUN PATH
SPECULARITY
control devices
aperature Location
CLIMATE
light tube
ORIENTATION
DIFFUSED
shading
filtering
funneling
PENUMBRA
UMBRA
APPARATURES
FORM
LIGHT SHADOW AND
REVEAL AND CONCEAL
APPEAR AND DISAPPEAR
EXPAND OR SHRINK
RECEDE OR OCCULATE
SINK OR LEVITATE
CALM OR EXCITE
UNIFY AND FRAGMENT
EXPAND OR SHRINK
SYMBOL
INDEX
KNOWLEDGE
POWER
PHILOSOPHY
NEEDS
DESIRES
THERE IS LIFE
REPRESENTATION
LIGHT
SPIRIT
CULTURE
TIME
METAPHYSICAL
That Light is purely spiritual beyond the light we see in this world, but which nevertheless is also a manifestation or extension of that light as is the entire creation.
PHYSICS
newton
ENERGY
warmth
OPTICS

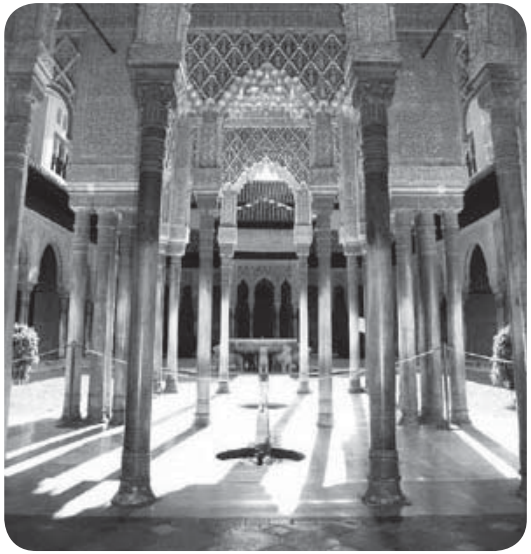
DIMENSIONS OF LIGHT

Through my literature reivew I approached the examination of light with vague open ended questions to offer a way of exploring light, while setting some loose boundaries.

What is light?
How is light QUANTIFIED?
How is light MODULATED?
How is light PERCIEVED?

STONEHENGE - 2500 BC - ENGLAND

RAVENNA - 712 AD - ITALY



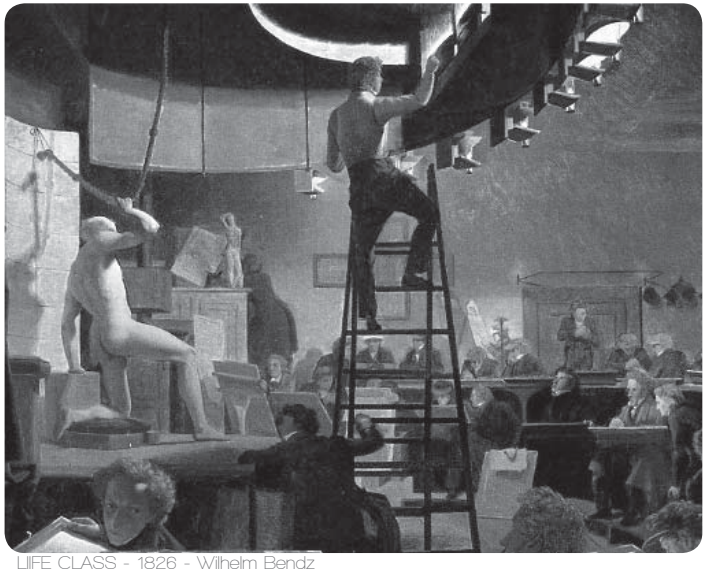
ALHAMBRA - 1450 - SPAIN

HISTORY OF LIGHT

The beginnings of the builIt environment mark man's relationship with light transcending necesity

Of all of daylight's powers, most miraculous is the capicity to endlessly change and transform itself - creating a sense of motion and inscribing into buildings an awareness of passing time, metamorphoses and fluidity all linked to the oldest forms of prehistoric architecture.

Basic ways by which light may charge and activate space - voids appear and disappear, unify or fragment, sink of levitate, expand of shrink, receded or oscillate, display or mood or atmosphere - alll have their origin in archaic forms of phototropic human experience.



LIFE CLASS - 1826 - Wilhelm Bendz

BIRTH OF VENUS - 1863 - Alexandre Cabanel

GALERIE D'ORLEANS - 1831 - FRANCE

CRYSTSAL PALACE - 1851 - ENGLAND

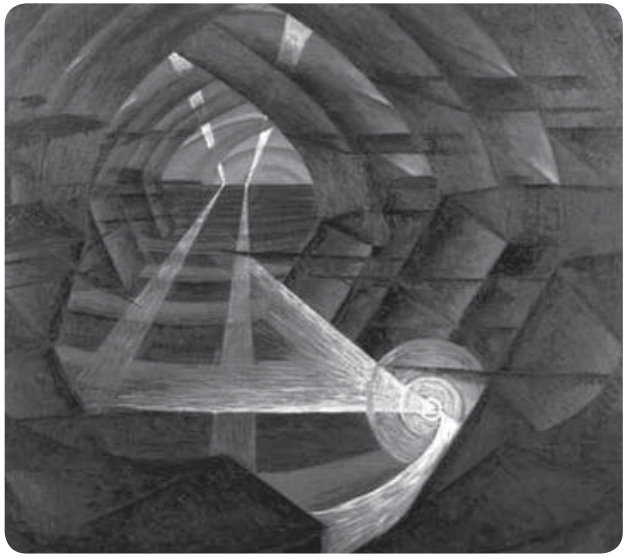
WINTER GARDEN- 1906- DENMARK

INVENTION OF GLASS

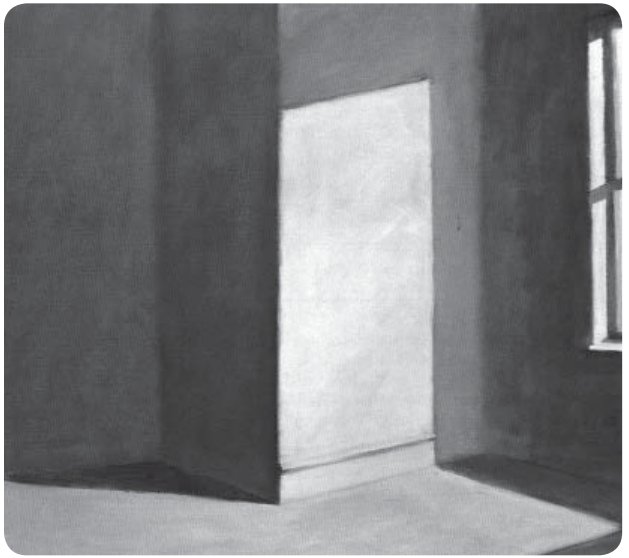
The industrial revolution and the invention of glass allowed building envelope filters light instead of enclosing space with massive walls, with that we can begin to take a closer look at the relationship of architecture and light in the 19th century.

The dramatically changing world at the end of the nineteenth century, modern man was facing industrialization, fluid social and physical structures, loss of fixed values - fragmentation of once solid realities was reflected in design of buildings, dissolving physical limits, open interiors expanded movement and feeling - freedom and leeway to explore and verify their own inner worlds

CHURCH OF ST PAUL - 1889- VANGOGH



STUDY FOR DYNAMIC ROOM- 1912- RUSSOLO



LIGHT IN AN EMPTY ROOM- 1963- HOPPER

MODERN RECONCEPTUALIZATION

In a modern reconceptualization of light, as reflected in the art of the time, rather than simply modeling form, light displays a presence of it's own.

Light is freed from objects, making it a paramount presence - making light around people something they can consume. It no longer illuminates things at all, but appears as a tactile energy pulsing though air and into forms as displayed in Van Gogh's and Rissolo's artwork.

This colorful light is never static, reflecting knowledge that is both fluid and temporal.

KIMBELL ART MUSEUM
Louis Kahn - 1972

MAISON de VERRE
Pierre Chareau - 1931

JOHNSON WAX HDQURTS
Frank Loyd Wright - 1939

RONCHAMP CHAPEL
Le Corbusier - 1955

LAW COURTS
Gunnar Asplund- 1937

BAGSVAERD CHURCH
Jorn Utzon- 1976

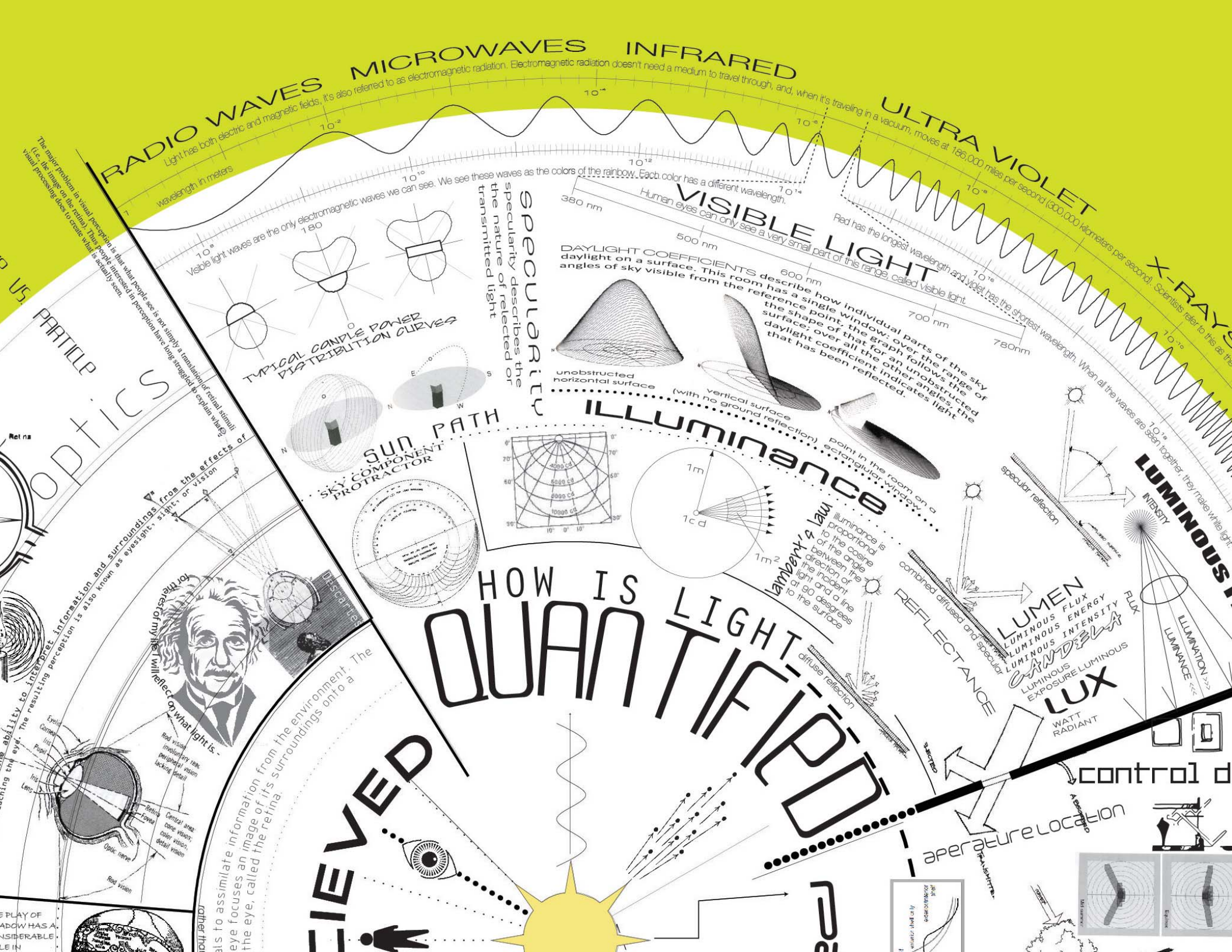
FREEDOM OF LIGHT

Vlsionaries of modern architecure gave visible form to metaphysical aspects of human existence, not upon canvas but within environments. These environments showed how rays are altered as they enter an opening, collect in one space and leave another in shadow, play over various textures and illuminate surfaces that heighten human awareness of light's fluid, presence of energy.

These architects drew on many means of forming and treating natural light to construct an image of OURSELVES and of the secular aspirations of a modern world. While primeval modes of experiencing light may permeate modern architecture - what is dramatically changed is the FREEDOM of light from any fixed meaning held in the past.

Instead of expressing a predetermined order imposed from without, light becomes a central theme in the individual psychic freedom. Light acquires HUMAN MEANING. Just as with art of this age, the modern architect no longer equates light with God, but to his own soul, making it a language of her inner most being.

We feel rather than think or see this kind of light.


RADIO WAVES
MICROWAVES
INFRARED
ULTRA VIOLET
X-RAYS
Light has both electric and magnetic fields, it's also referred to as electromagnetic radiation. Electromagnetic radiation doesn't need a medium to travel through, and, when it's traveling in a vacuum, moves at 186,000 miles per second (300,000 kilometers per second). Scientists refer to this as the
wavelength in meters
Visible light waves are the only electromagnetic waves we can see. We see these waves as the colors of the rainbow. Each color has a different wavelength.
Red has the longest wavelength and violet has the shortest wavelength. When all the waves are seen together, they make white light.
VISIBLE LIGHT
Human eyes can only see a very small part of this range, called visible light.
380 nm
500 nm
600 nm
700 nm
780nm
The major problem in visual perception is that what people see is not simply a translation of retinal stimuli (i.e., the image on the retina). Thus people interested in perception have long struggled to explain what is
visual processing does to create what is actually seen.
PARTICLE
OPTICS
Retina
The ability to interpret information and surroundings from the effects of
eyesight, sight, or vision
The resulting perception is also known as eyesight, sight, or vision
Cornea
Iris
Pupil
Lens
Retina
Fovea
Optic nerve
Rod vision
Cone vision
Central area: color vision, detail vision
Rod vision: involuntary task, peripheral vision lacking detail
TYPICAL CANDLE POWER DISTRIBUTION CURVES
180
0
SUN PATH
SKY COMPONENT PROTRACTOR
specularity
specularity describes the the nature of relected or transmitted light
DAYLIGHT COEFFICIENTS describe how individual parts of the sky daylight on a surface. This room has a single window: over the range angles of sky visible from the reference point, the graph follows the of the reference point, the shape of that for an unobstructed the shape of the other angles, the surface; over all the other angles, the daylight coefficient indicates light that has been reflected.
unobstructed horizontal surface
vertical surface (with no ground reflection)
point in the room on a rectangular window
ILLUMINANCE
4000 cd
6000 cd
8000 cd
10000 cd
1m
1cd
1m2
lambert's law
illuminance is proportional to the cosine of the angle between the direction of the incident light and a line at 90 degrees to the surface
HOW IS LIGHT
QUANTIFIED
REFLECTANCE
specular reflection
combined diffused and specular
diffuse reflection
LUMEN
LUMINOUS FLUX
LUMINOUS ENERGY
LUMINOUS INTENSITY
CANDELA
LUMINOUS EXPOSURE
LUX
WATT
RADIANT
FLUX
LUMINOUS
INTENSITY
ILLUMINATION >>>
LUMINANCE <<<
control d
aperture location
ABSORBED
TRANSMITTED
REFLECTED
SOURCE
RECEIVER
D.S.Carlson
Portrait of my life: I will reflect on what light is -
ELECTED
ather than
als to assimilate information from the environment. The
eye focuses an image of it's surroundings onto a
the eye, called the retina.
E PLAY OF
ADOW HAS A
NSIDERABLE
LE IN

HOW IS LIGHT QUANTIFIED?

LUMINOUS INTENSITY The visible radiant intensity in a particular direction is called (I).

LUMINOUS FLUX All the radiated power emitted by a light source and perceived by the eye is called.

ILLUMINANCE E indicates the degree to which an area is illuminated. It is the ratio between luminous flux and the area to be illuminated.

SPECULARITY describes the nature of reflected or transmitted light. A specular surface reflects light in a directional manner such that the angle of reflection is equal to the angle of incidence. A mirror is a specular surface. In contrast, a matte surface, such as a swatch of fabric, reflects light in a non-directional manner. Most surfaces are semi-specular, reflecting some light specularly and some light diffusely. Since semi-specular surfaces are difficult to describe mathematically, they are typically treated intuitively in lighting design practice.

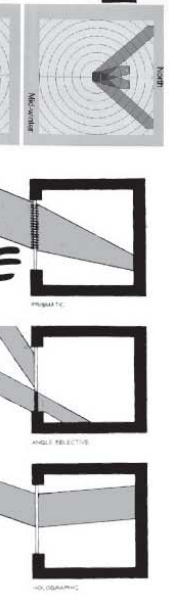
TRANSMITTANCE is the fraction of light which passes through an object. It is an important property to consider for glazing design since the transmittance will impact the amount of daylight available for natural illumination. Transmittance is a material property and is independent of the amount of light which reaches the material.

PHOTOMETRICS tell lighting designers how a particular luminaire will send light. They are based on how the luminaire distributes candela. When represented graphically, the candlepower or photometric distribution curves provide intuitive information to the lighting designer and give an indication of how the luminaire will perform in the space. The actual candela values are used in calculations to predict light levels and/or brightness levels within the space.

BRIGHTNESS is the subjective impression of the amount of light leaving a surface and reaching the eye. Since brightness is based on human response and is dependent on the adaptation level of the eye, it cannot be directly measured. Comparing luminance or exitance values of surfaces (since they can be measured or calculated) within the field of view allows lighting designers to determine the overall comfort of a lighting system.

REFLECTANCE is the fraction of light exiting a surface compared to the amount of light falling on a surface. Dark and/or textured surfaces absorb a lot of light and therefore have a low reflectance while light and/or smooth surfaces reflect a lot of light and therefore have a high reflectance. Reflectance is a material property and is independent of the amount of light which reaches the surface.


PERCIE
how it light
modulate
KNOWLEDGE
ICON SYMBOL INDEX
the poetic image
FORM
APPARATURES
light
shading
light tube
ORIENTATION
DIFFUSED
LIGHT SHADOW AND
MUTUAL DEPENDENCE OF
reverie to apprehend
ACTIONS OF LIGHT
REVEAL AND CONCEAL
APPEAR AND DISAPPEAR
EXPAND OR SHRINK
RECEDE OR OCCILATE
SINK OR LEVITATE
CALM OR EXCITE
UNIFY AND FRAGMENT
EXPAND OR SHRINK
funneling
filtering
penumbra
umbra
CLIMATE
Shadows are something standing for something else
LIGHT IS INTERTWINED WITH HUMAN LIFE, IT STRUCTURES AND IS STRUCTURED BY OUR ENGAGEMENT WITH THE WORLD, IT SHAPES AND IS SHAPED BY OUR KNOWLEDGE AND CULTURE
Mid-winter
Equinox
Mid-summer



HOW IS LIGHT MODULATED?

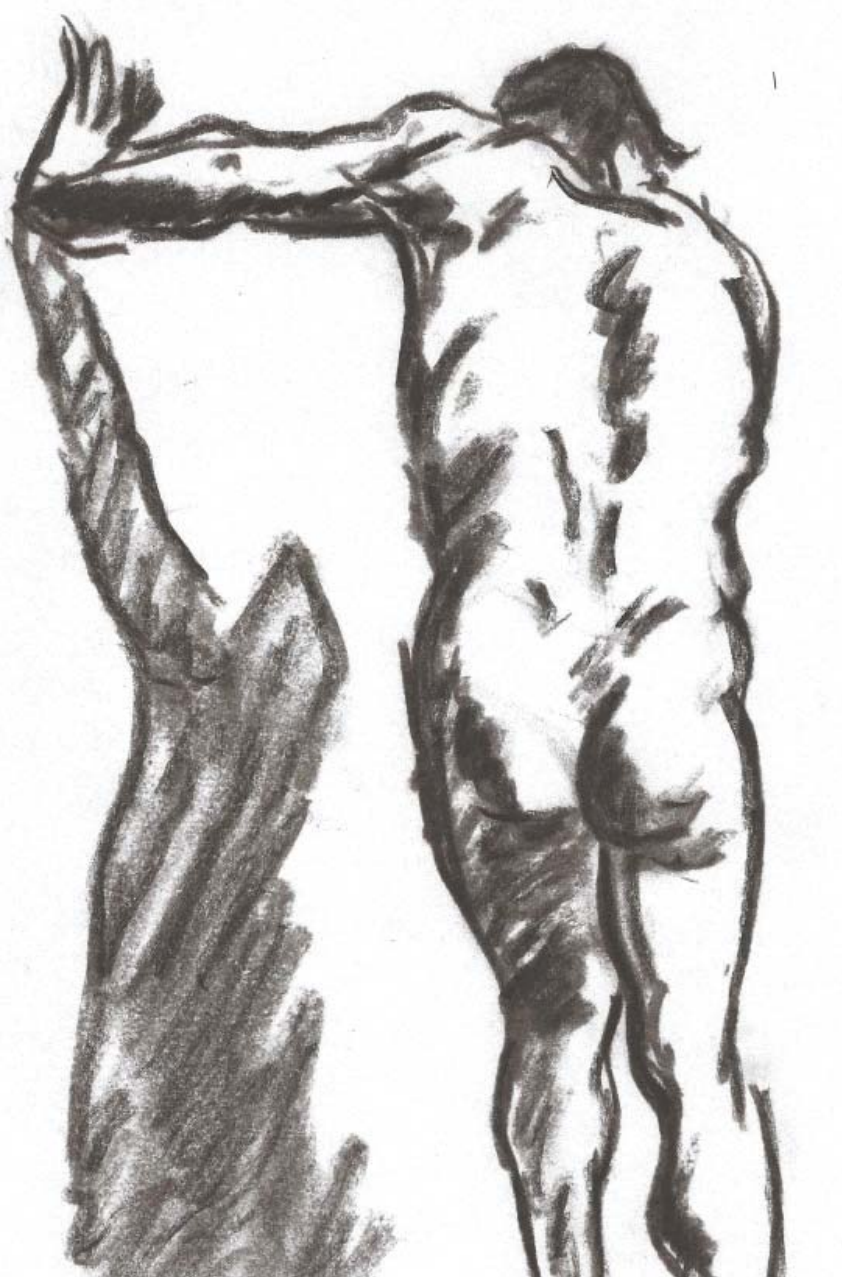
There are countless reasons for a renewed interest in daylighting, the increasing cost of fossil fuels and realization that sources of electricity have a finite life. As a compliment and counterpoint, for purposes of this thesis I am investigating the less tangible aspects and arguably equally as important aspects of daylighting which relate more to the human in their totality and the need for a emotive quality of life. Change and variability, modeling, orientation, sunlight effect, color and views together create a paramount importance in daylighting space.

Le Camus was the first architectural theoretician to discuss the effects of lighting and their impact on our perception of spaces and their qualities. He compares the art of using light and shadow in architecture to the art of a skillful painter who knows how to take advantage of the effects of shadings and how to used nuances of tints to impart harmony to the whole. For Le Camus, however, the use of light in architecture was not equivalent to painterly concern with color, or to the frozen moment of a painting. The changing position of the sun during the day continually transforms the light that falls on a building and consequently, the general distribution of program is best served by accounting for the particular orientation of each room.

The intimate relationship between the distribution of rooms and the movement of the sun was not unique to Le Camus's theory, for Vitruvius had recommended that baths and winter apartments be oriented toward the "wintry sunset." Le Camus's discourse on distribution, however is not concerned, like that of his predecessor, with health, cosmology or typology. For Camus, the "quality of light in optic plays into an architectural composition, and simultaneously transforms the users space into spectators of an architectural sunset in which the sharp contrast of shadows and the subsequent dimming of light announce the melancholy of the night.

The modulation of light and shadow became an important way to convey meaning in architecture, and for Le Camus this crucial means of expression became a central distinction from precious character theories in architecture. Rather than a codified language where every sign would have one single interpretation that could be read unambiguously, the architecture of light and shadow orchestrated a mélange of emotive attributes to be perceived through the senses.

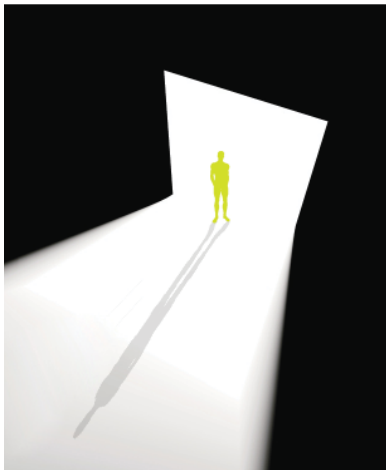
Light, shadow and color shape our perception of space. We can manipulate them through lenses, screens and reflective surfaces. Through modulation, dynamic relationships are revealed by shadows, using them to disclose the light source, object and surface.
An object can be considered a light modulator, for as it reflects the light it also modulates or changes the rays which strike it. It reflects some rays, absorbs others, possibly permits others to pass through if it is transparent while refracting them to some degree, or if the substance is translucent, it diffuses the ray that are neither reflected nor absorbed.



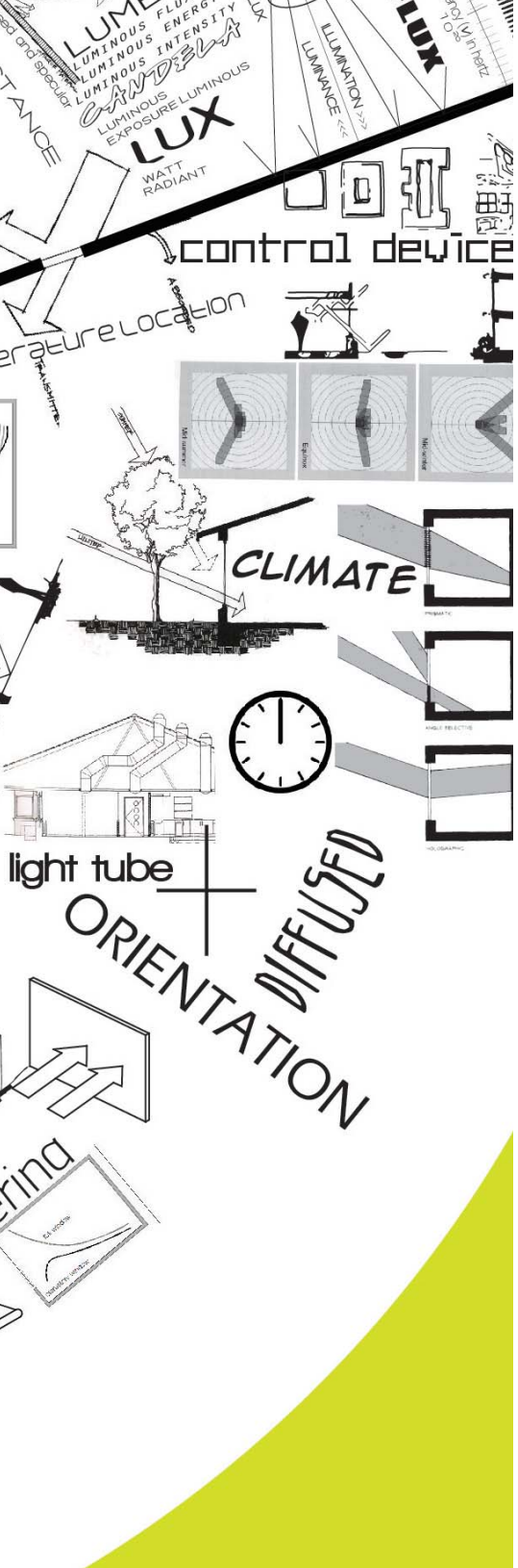
HUMAN AS MODULATOR

Whiile architecture, form and space can be crafted in modulate light in a vaariance of ways it is important to recognise the inhabitant of these spaces as a modulator themsellves. The human body is the best-known of all light modulators, and could be said to rank near the top of the list in complexity. Straight lines are few, flat surfaces, if any, are small. Surfaces and lines are nearly all curved and there are very few surfaces of plane curvature - curving in only one direction as on a cylinder, for most are compound curves.

Surface texture and color vary with a the person's age, as the skin of a baby is vastly different from that of the elderly, and there are countless degrees of difference. Add to these natural differences in skin color and texture and overall body shape and you have an extensive study of light, trace and subsequent shadow.




Cones in our eyes are receivers for these tiny visible light waves. The Sun is a natural source of visible light waves and our eyes see the reflection of this sunlight off the objects around us.
ENERGY
newton
PHYSICS
Visual perception is the ability to interpret information from visible light reaching the eye. The resulting perception is also
Iris
Lens
Optic nerve
Red vision
Central sharp vision, color vision, detail vision
Red visual impairment, peripheral vision lacking detail
Definition of Form
Sensor my life I will reflect on what light is. -
That Light is purely spiritual beyond the light we see in this world, but which nevertheless is also a manifestation or extension of that light as is the entire creation.
TIME
METAPHYSICAL
the language of light relects certain timeless human NEEDS and DESIRES
PHILOSOPHY
WHERE THERE IS LIGHT THERE IS LIFE
BEHAVIOR MIND AND BODY
BEHAVIOR TRAINING AND ACTION
POWER
while it is true that nothing can be visible without light, light also makes it possible to express and show to the MIND'S EYE things that elude the pysical one.
ONTOLOGY
LIGHT SPIRIT CULTURE
REPRESENTATION
the soul employs reverie to apprehend the poetic image
THE PLAY OF SHADOW HAS A CONSIDERABLE ROLE IN DETERMINING THE METAPHYSICAL ATMOSPHERE EMOBIDED BY THE OBSERVER
SHADOWS ARE EXTRODINARY VISUAL SIGNS WITH TRADIC NATURE INWHICH LIE RECONDITE CORBORAL PROCESS EMBODIED IN ARCHITECTURE UNFOLDS
KNOWLEDGE
LIGHT IS INTERTWINED WITH HUMAN LIFE IT STRUCTURES AND IS STRUCTURED BY OUR KNOWLEDGE AND CULTURE. THE WORLD IT SHAPES AND IS SHAPED BY OUR KNOWLEDGE AND CULTURE
ICONOSYMBOLIC INDEX
wisom is a capacity a gift of nature which can be developed by deep awareness and she brings out to be expressed in our attitudes and actions. Wisdom is not a potential inherent in our
Shadows are something standing for something else
LIGHT SHADOW AND FORM
MUTUAL DEPENDENCE OF
ACTIONS OF LIGHT
REVEAL AND CONCEAL
APPEAR AND DISAPPEAR
EXPAND OR SHRINK
DIVIDE OR OCCLIATE
ATTRACT OR LEVITATE
REFLECT OR EXCITE
FRAGMENT
SHRINK
rather than simply modeling form - light displays a presence of it's own
How Light is PERCIEVED
the light we see is a small part of the vast spectrum of energy that is present in the universe. Light is a sensitive medium that is spread in all directions from every point of every source of light, and it occupies and fills the entire space in which it spreads. Light is sensitive to the presence of objects in the space it occupies, and it is affected by them in a variety of ways. Light is also sensitive to the presence of the eye, and it is affected by the eye in a variety of ways. Light is also sensitive to the presence of the mind, and it is affected by the mind in a variety of ways. Light is also sensitive to the presence of the soul, and it is affected by the soul in a variety of ways. Light is also sensitive to the presence of the spirit, and it is affected by the spirit in a variety of ways. Light is also sensitive to the presence of the divine, and it is affected by the divine in a variety of ways. Light is also sensitive to the presence of the infinite, and it is affected by the infinite in a variety of ways. Light is also sensitive to the presence of the eternal, and it is affected by the eternal in a variety of ways. Light is also sensitive to the presence of the absolute, and it is affected by the absolute in a variety of ways. Light is also sensitive to the presence of the unconditioned, and it is affected by the unconditioned in a variety of ways. Light is also sensitive to the presence of the unlimited, and it is affected by the unlimited in a variety of ways. Light is also sensitive to the presence of the boundless, and it is affected by the boundless in a variety of ways. Light is also sensitive to the presence of the timeless, and it is affected by the timeless in a variety of ways. Light is also sensitive to the presence of the spaceless, and it is affected by the spaceless in a variety of ways. Light is also sensitive to the presence of the formless, and it is affected by the formless in a variety of ways. Light is also sensitive to the presence of the nameless, and it is affected by the nameless in a variety of ways. Light is also sensitive to the presence of the indescribable, and it is affected by the indescribable in a variety of ways. Light is also sensitive to the presence of the ineffable, and it is affected by the ineffable in a variety of ways. Light is also sensitive to the presence of the mysterious, and it is affected by the mysterious in a variety of ways. Light is also sensitive to the presence of the sacred, and it is affected by the sacred in a variety of ways. Light is also sensitive to the presence of the holy, and it is affected by the holy in a variety of ways. Light is also sensitive to the presence of the divine, and it is affected by the divine in a variety of ways. Light is also sensitive to the presence of the infinite, and it is affected by the infinite in a variety of ways. Light is also sensitive to the presence of the eternal, and it is affected by the eternal in a variety of ways. Light is also sensitive to the presence of the absolute, and it is affected by the absolute in a variety of ways. Light is also sensitive to the presence of the unconditioned, and it is affected by the unconditioned in a variety of ways. Light is also sensitive to the presence of the unlimited, and it is affected by the unlimited in a variety of ways. Light is also sensitive to the presence of the boundless, and it is affected by the boundless in a variety of ways. Light is also sensitive to the presence of the timeless, and it is affected by the timeless in a variety of ways. Light is also sensitive to the presence of the spaceless, and it is affected by the spaceless in a variety of ways. Light is also sensitive to the presence of the formless, and it is affected by the formless in a variety of ways. Light is also sensitive to the presence of the nameless, and it is affected by the nameless in a variety of ways. Light is also sensitive to the presence of the indescribable, and it is affected by the indescribable in a variety of ways. Light is also sensitive to the presence of the ineffable, and it is affected by the ineffable in a variety of ways. Light is also sensitive to the presence of the mysterious, and it is affected by the mysterious in a variety of ways. Light is also sensitive to the presence of the sacred, and it is affected by the sacred in a variety of ways. Light is also sensitive to the presence of the holy, and it is affected by the holy in a variety of ways.
QUANTIFIED
LIGHT
diffuse reflection
how light
modulated
shading
funneling
filte
The umbra, penumbra and antumbra are the names given to three distinct parts of a shadow created by any light source. For a point source only the umbra is cast. The umbra is the darkest part of the shadow where the light source is completely blocked by the occluding body. An observer in the umbra experiences a total eclipse. The penumbra is the region in which only a portion of the light source is obscured by the occluding body. An observer in the penumbra experiences a partial eclipse. An alternative definition that the penumbra is the region where some or all of the light source is obscured.
penumbra
umbra
direct sunlight (e.g., South window at noon)
indirect sunlight (e.g., North window at noon)
30 ft
Mid-winter
Equinox
no overhang
medium overhang
deep overhang
louvers
deep overhang



HOW IS LIGHT PERCIEVED?

Visual perception is the ability to interpret information and surroundings from the effects of visible light reaching the eye. The resulting perception is also known as eyesight, sight, or vision (adjectival form: visual, optical, or ocular). The various physiological components involved in vision are referred to collectively as the visual system, and are the focus of much research in psychology, cognitive science, neuroscience, and molecular biology.

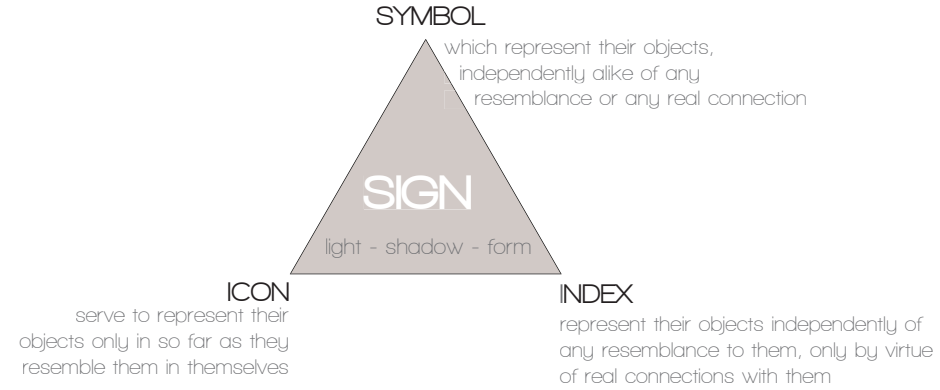
The major problem in visual perception is that what people see is not simply a translation of retinal stimuli (i.e., the image on the retina). Thus people interested in perception have long struggled to explain what visual processing does to create what is actually seen.

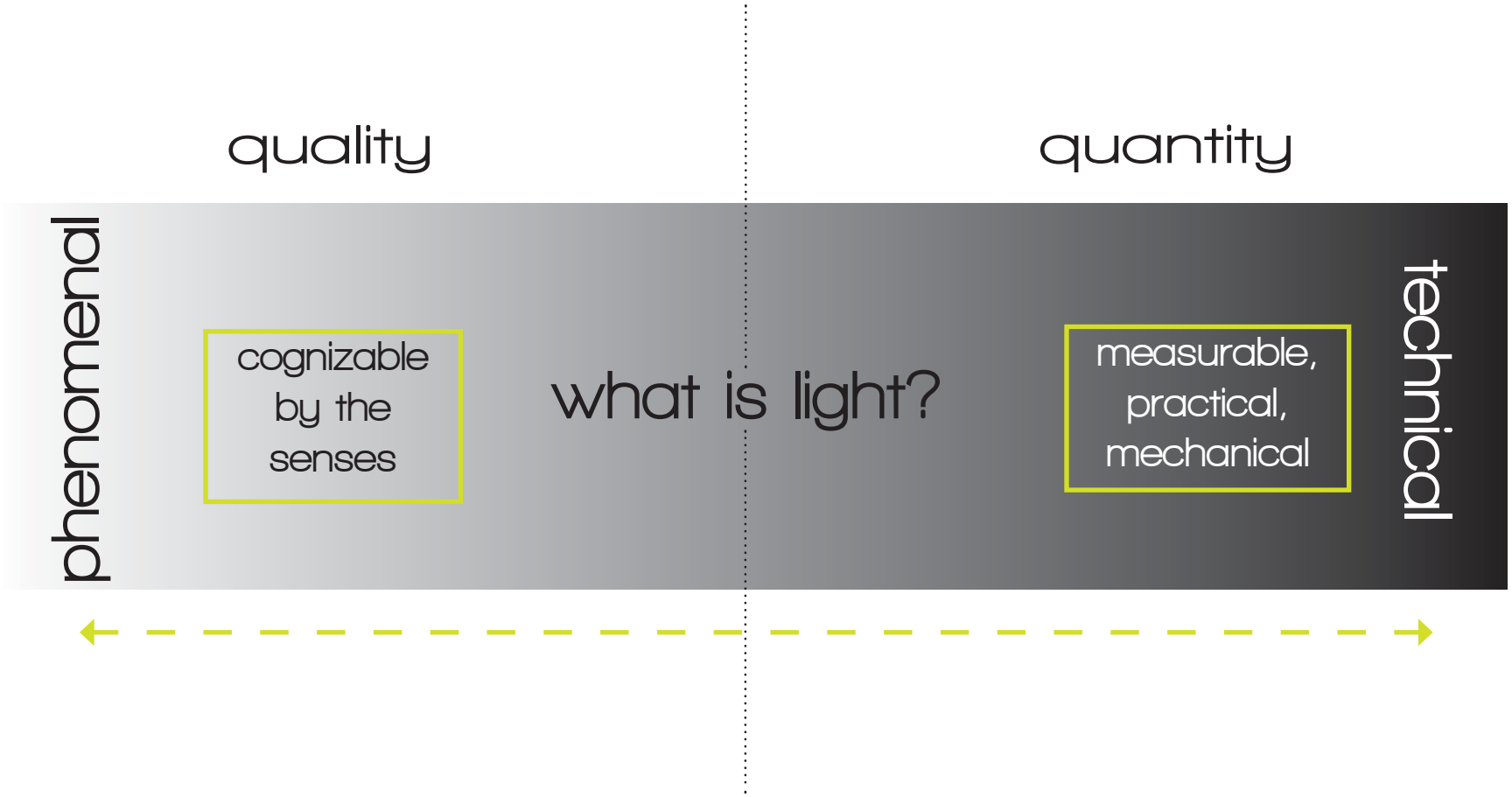
Optics is the branch of physics which involves the behavior and properties of light, including its interactions with matter and the construction of instruments that use or detect it. Optics usually describes the behavior of visible, ultraviolet, and infrared light. Because light is an electromagnetic wave, other forms of electromagnetic radiation such as X-rays, microwaves, and radio waves exhibit similar properties.

Most optical phenomena can be accounted for using the classical electromagnetic description of light. Complete electromagnetic descriptions of light are, however, often difficult to apply in practice.

Philosophically without our awareness light affects on our cognitive and emotional behavior. It can stimulate production of serotonin, dopamine and gamma-aminobutyric acids enhancing impulse control, motivation, muscle coordination, calmness and focus.

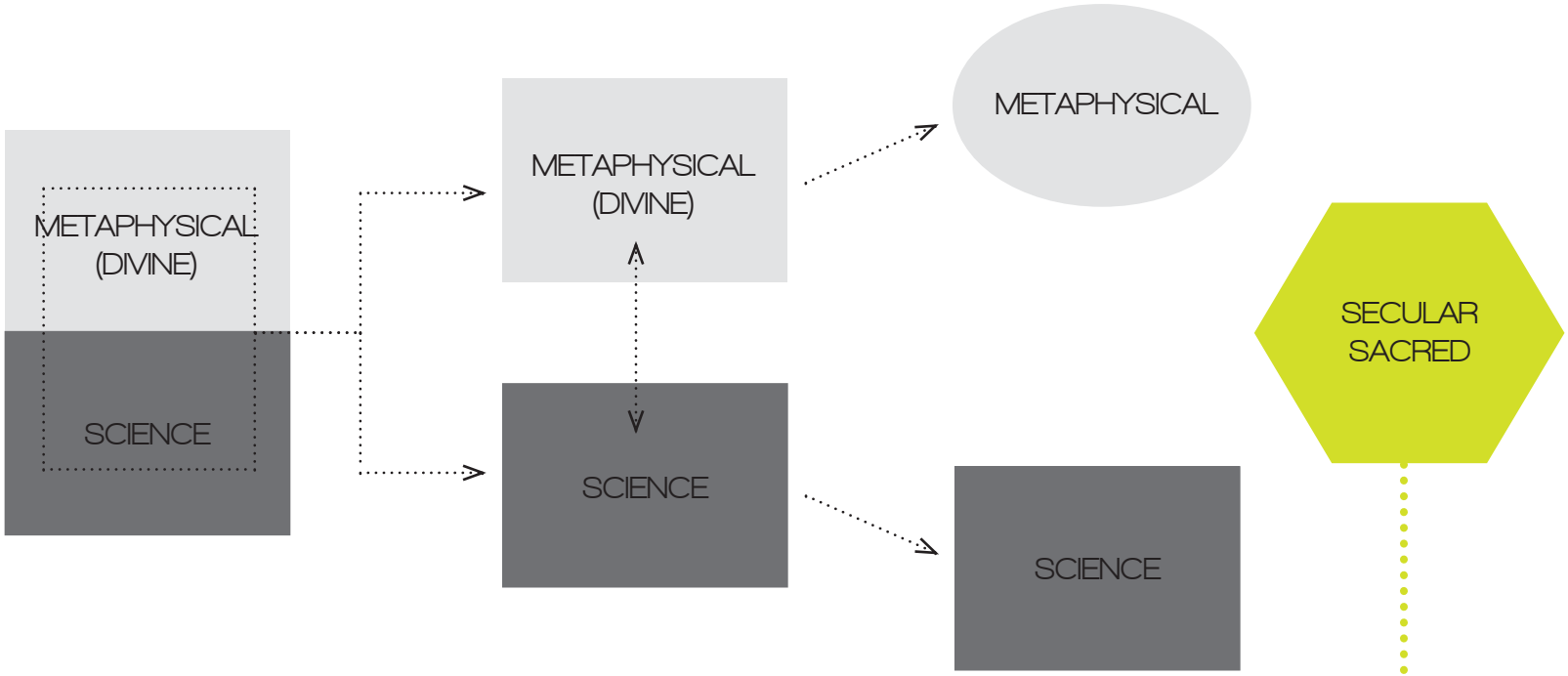
Perceptual issues in philosophy include the extent to which sensory qualities of light and colors exist in objective reality rather than the mind of the perceiver. Light is associated with noptical quallities such as warmth, control of energy, noise and knowledge. Shadows are preceived as signs, indexical, iconic and symbolic.




quality
quantity
phenomenal
technical
cognizable by the senses
what is light?
measurable, practical, mechanical

WHAT IS LIGHT?

To address the potential of this relationship in a design thesis, one must realize that there is a crucial difference between an objective description of light and what we perceive. It is not merely the quantity of light that is of imporantace, but the character of light. While measures differ drastically, there is a direct relationship and each of the poles, phenomenal and technical, exist in a continum of quality and quantity.



In antiquity light was understood as both metaphysical (divine)/ science

Egyptians - perceptually and symbolically worshiped the sun god, Ra

In the age of enlightenment the scientific aspects are viewed and studied as a separate entity to the divine understanding of light, but are used to support claims of each other

"Mathematics is the language with which God has written the universe." - Gallileo

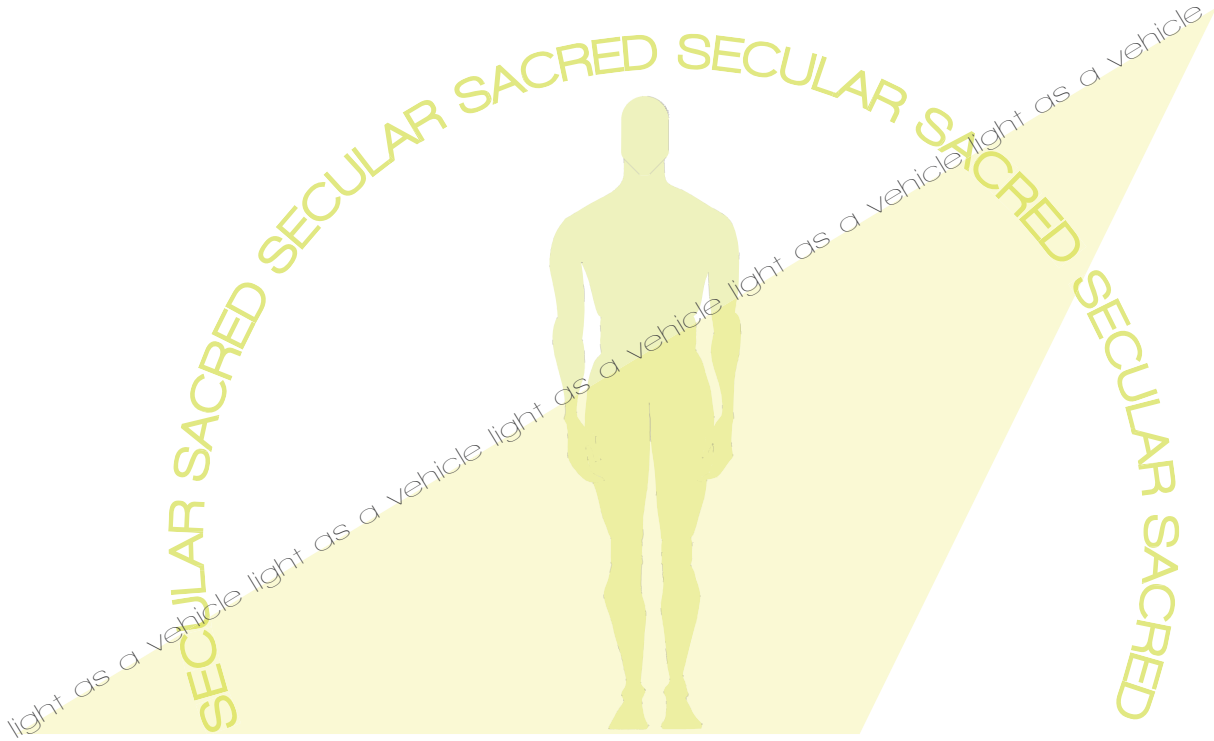
With the advent of Modernity science or technical side of light is refined and disparate from the now perceivalby meta physical aspects of light

UNDERSTANDING LIGHT

The perceived nature of understanding and defining of light has changed throughout the ages.
Broadly speaking, as I understand it from my research there are three distinct ways in which light was studied and defined from antiquity to modern day.

There has been a clear distinction in light being both divine or metaphysical as well as, scientific or technical.

I am proposing a new model with which to understand light...


SECULAR SACRED SECULAR SACRED SECULAR SACRED SECULAR SACRED
light as a vehicle light as a vehicle light as a vehicle light as a vehicle light as a vehicle

SECULARSACRED

an environment that initiates a **SENSITIZED** encounter of **self**
in the world with profound **specificity.**

it is a **SINGULARITY WHICH SURPASSES** the sphere
of everyday **normality** to challenge instrumetalized architecture
that fails to sustain immaterial and the **ideal totality** of our lives

ETHEREALITY
orchestration of light to mutate through time

SEQUENCE
choreography of light for the moving eye

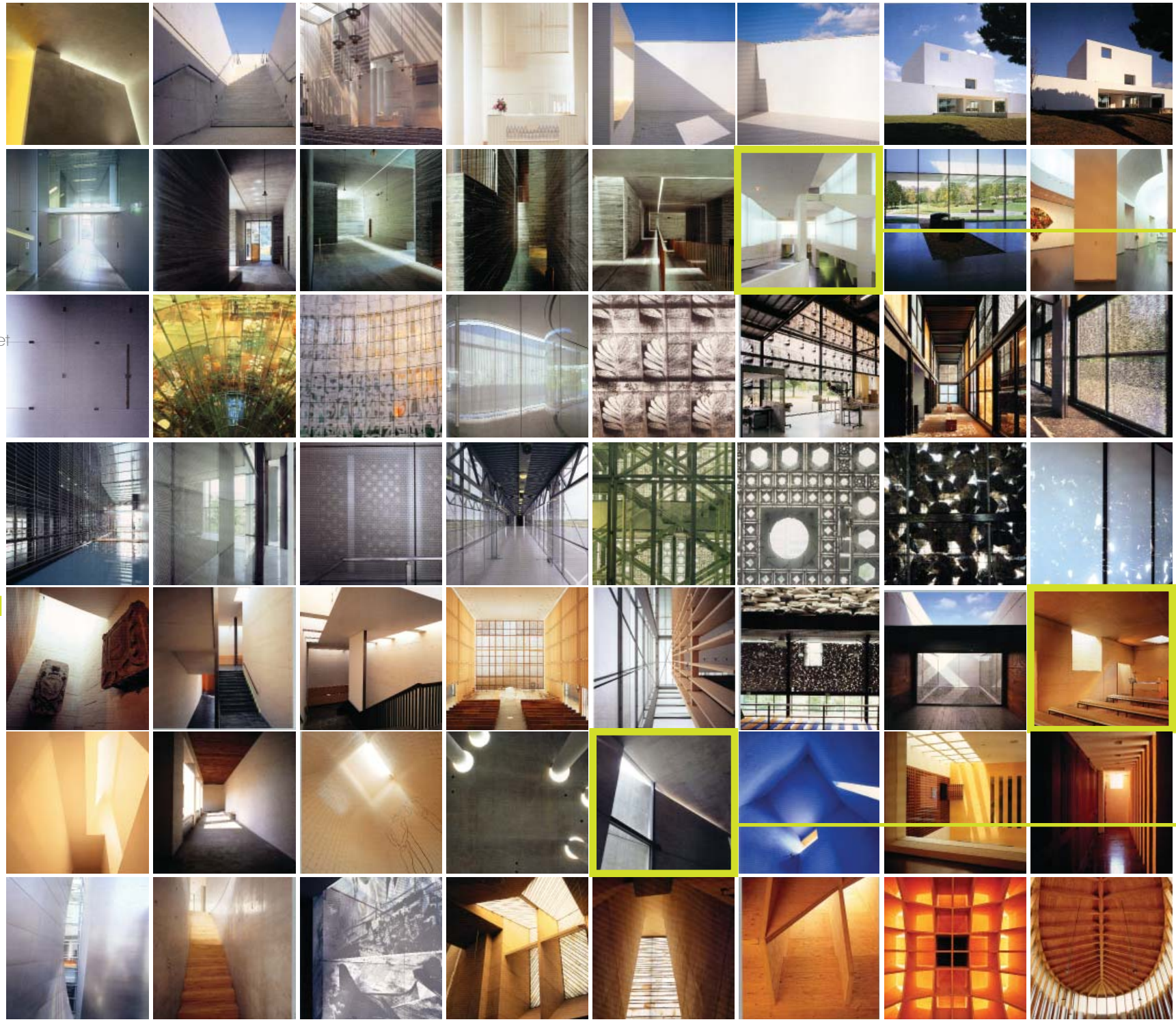
VEILS OF GLASS
refraction of light in trasluscnet film

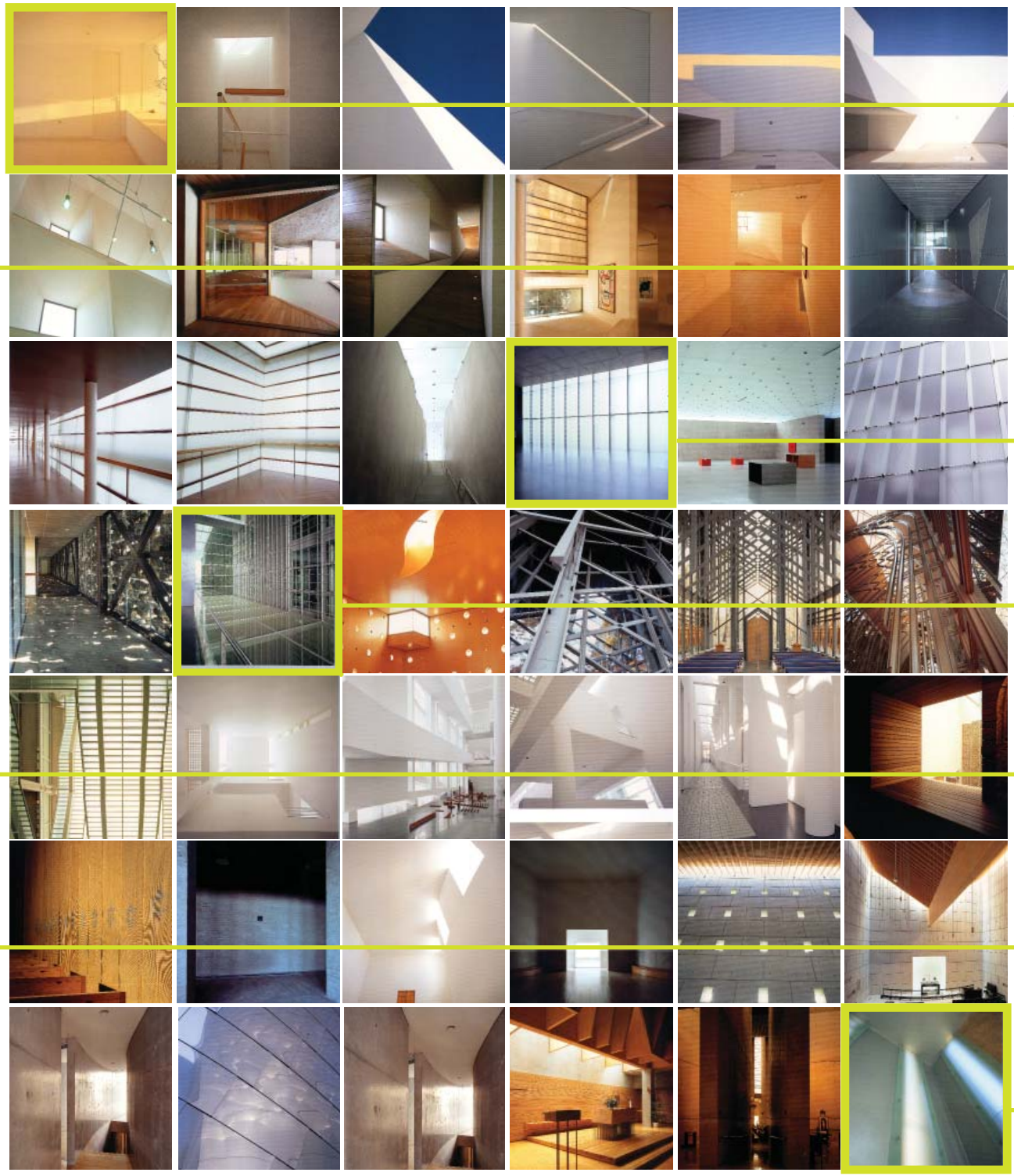
DISSOLUTION
sifting of light through porous scrim

CHANNELIZATION
channeling of light through hollow mass

SILENT SUFFUSION
diffusion of light with a unified mood

LUMINESCENCE
materialization of light in physical matter





ASCENCIO HOUSE
Alberto Campo Baeza
Spain, 2001

BLOCH BUILDING
Steven Holl
Miissouri, USA 2007

KUNSTHAUS BREGENZ
Peter Zumthor
Austria, 1997

CULTURE & CONGRESS CENTRE
Jean Nouvel
Switzerland, 1999

LEON CITY MORGUE
BAAS
Spain, 2000

CHURCH OF LIGHT
Tadioa Ando
Japan, 1989

TIRSCHENREUTH CHAPEL
Bruckner & Bruckner
Germany, 2000

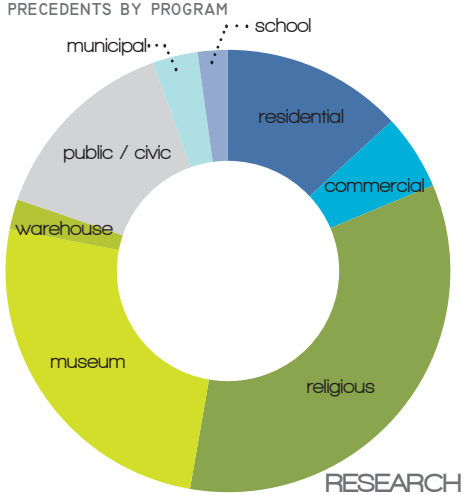
PRECEDENTSTUDY

Through a precedent study, taxonomy and analysis of architecture from the last 20 to 30 years a typological language was developed that categorizes architectural space in terms of contrast, types of modulation and temporal variation. The precedent survey included buildings of varying programs, and materiality from disparate countries and cultures.

Using this system of categorization, I was able to analyze the way in which daylight affected procession and habitation while exploring the ways in which light is modulated - establishing a metric for quantification and qualification as a counterpoint to daylight performance measures to provide a more holistic analysis of light in space and on form.

From literature studies I surveyed over 100 buildings and found an distinct relationship between the use of extraordinary light and typology/ program. The least amount of the buildings had to do with everyday normality.

PRECEDENTS BY PROGRAM



For the rest of my life I will reflect on what light is.

Einstein

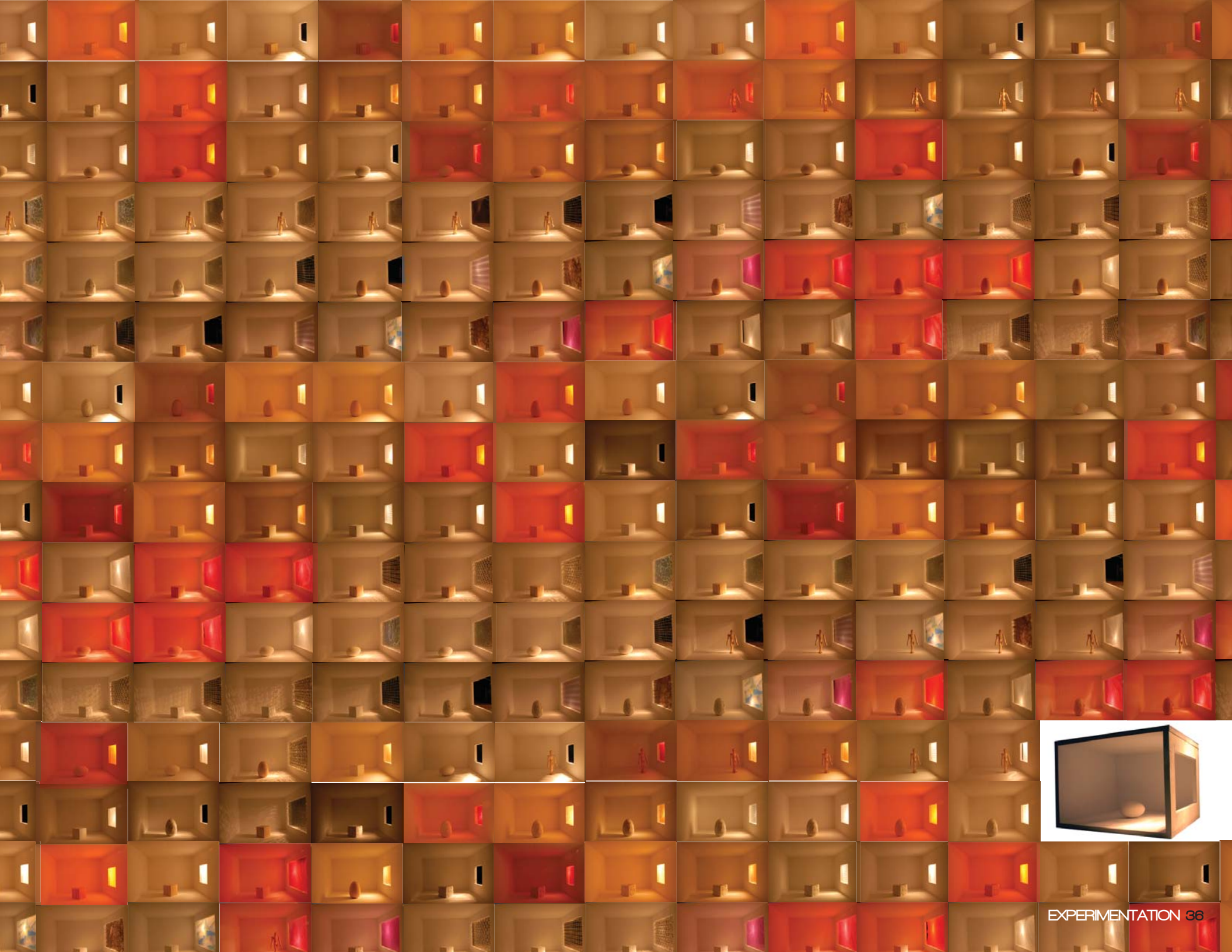
EXPERIMENTATION

An exploration of a specific material property, reflectivity, and the effects of light in space and on form were performed drawing from materials and their specific properties to discern certain forms, textural qualities and apertures.

Reflectivity as a material property operates on the extreme end of the spectrum of transparency. Transparency is a way of introducing layers of space and juxtaposing spaces on top of one another. Reflectivity, on the other hand, has the special property of recreating an image almost exactly but one that is dependent as an effect on the actual eye of the viewer.

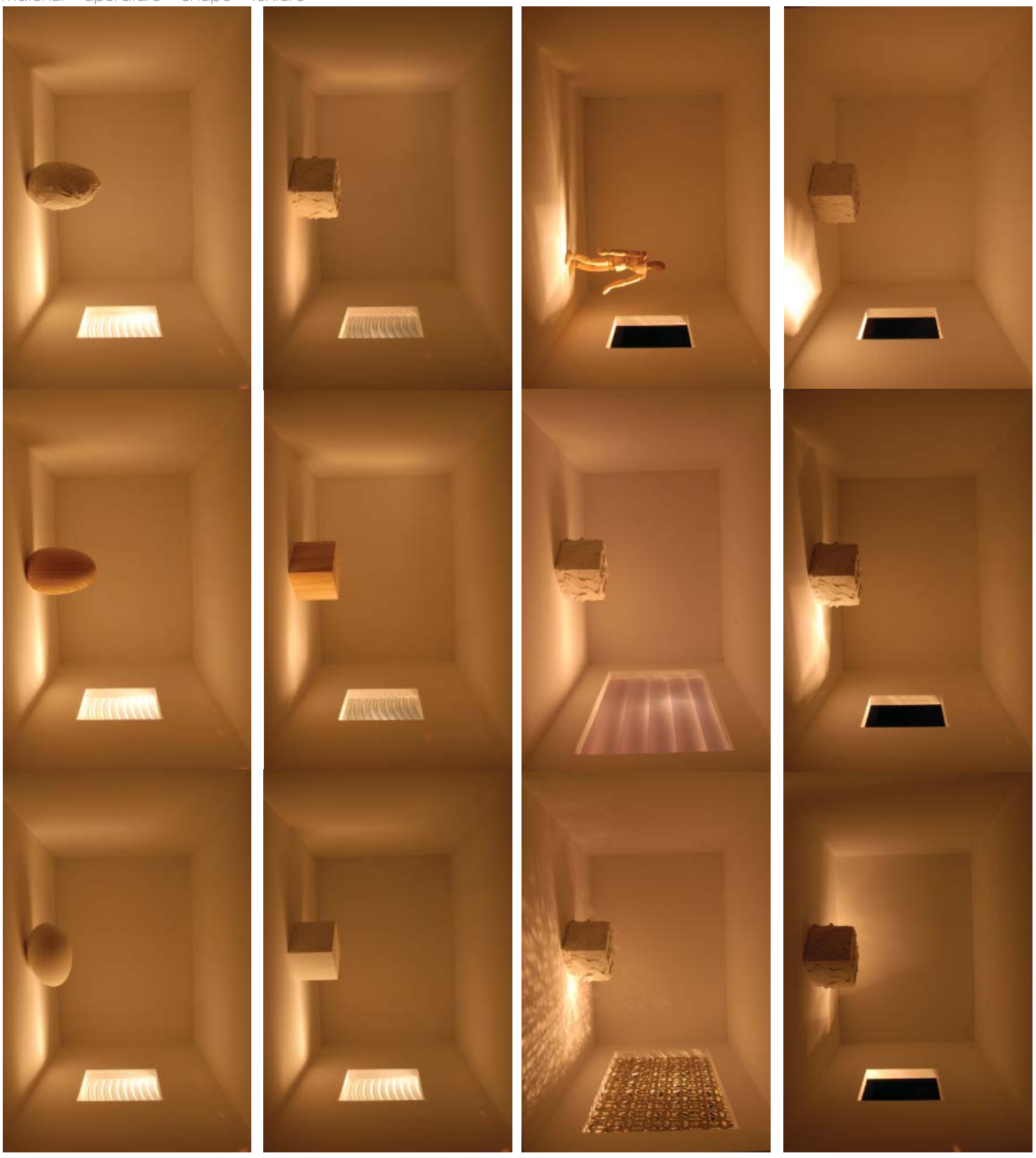
The light boxes didn't speak much to the complex qualities of daylight - past the fact that I had three lights set up on different angles - however I was able to learn a lot about the way in which light passes through a transparent, semi-transparent and perforated material. Additionally, I was able to meticulously look at the way in which certain filters rendered a variety of surfaces, and textures. Lastly, I used three different sized apertures to begin to look at the amount of light that enters and how much of a space it touches.

The construction of and experimentations with a hellidon allowed me to study the specific angles of light associated with times of day and year.

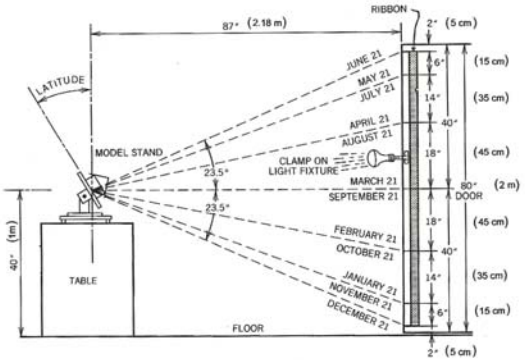


LIGHTBOXSTUDY

material - aperature - shape - texture

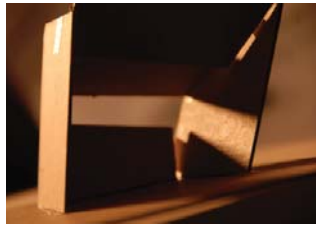


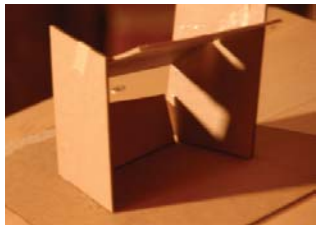
HELIODONEXPERIMENTATIONS

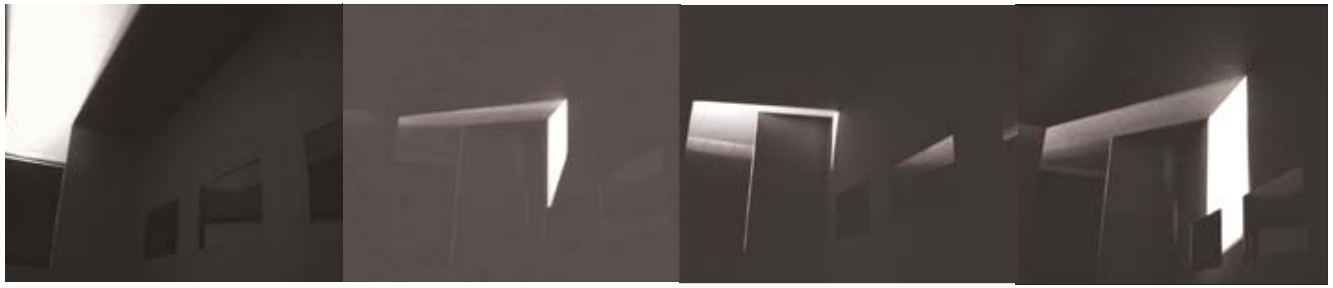


The construction of and experimentations with a helidon allowed me to study the specific angles of light associated with times of day and year Generic studies of light model moments were arguably very valuable as the acquired knowledge contributed to the design process at the conception stage, introducing criteria that influenced the forms and buildings I later designed.

The disadvantage of using a lamp source is that it does not contain the full spectrum that sunlight does causing a slightly different definition of space and rendering of light. As with most problems encountered in experimentation there were solutions for some of these difficulties and some "accurate" images were obtained and comparative discussions were valuable.







The helidon offered a process driven value - where as the photos that were taken didn't offer much information because the camera often adjusted the varying lighting conditions created. I created both a physical model and computer model of a particular condition and compared light rendered digitally to that rendered with the point source and helidon - the results differed but comparatively didn't offer much information.

Shadows are extraordinary visual signs with triadic nature, in which the recondite corporal process embodied in architecture unfolds.

Frascari

OBSERVATIONS

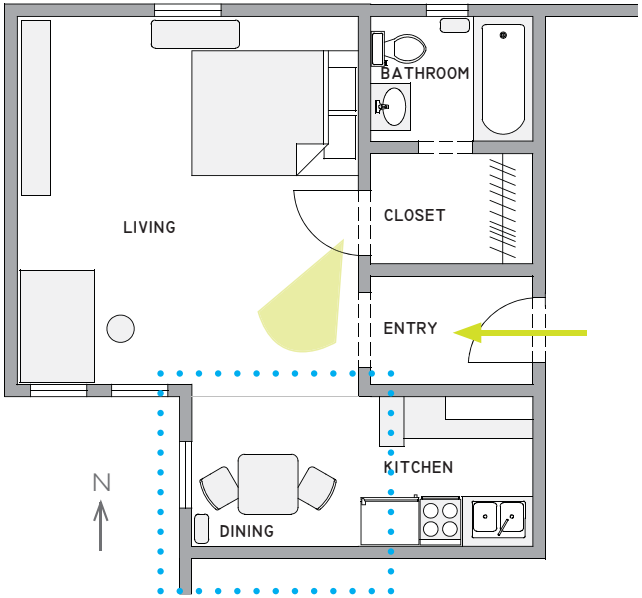
With a foundational understanding of light I chose to explore and observe my direct surroundings and how light interacts with different objects both inside and outside of the built environment with the goal of uncovering relationships between light and shadow.

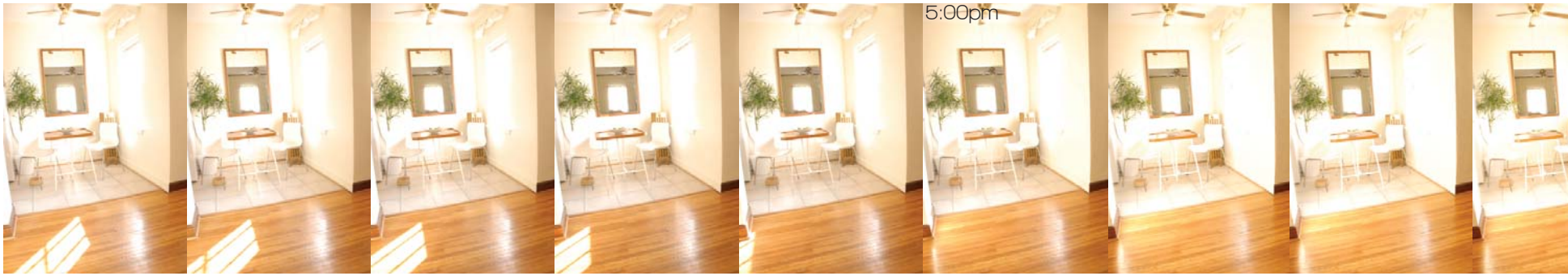
I began the observation study of light with shadows, because they are easily observed and lend themselves well to prediction, measurement and overall analysis. They have a behavior that is not entirely simple but which can be completely understood knowing that light travels in a straight line.

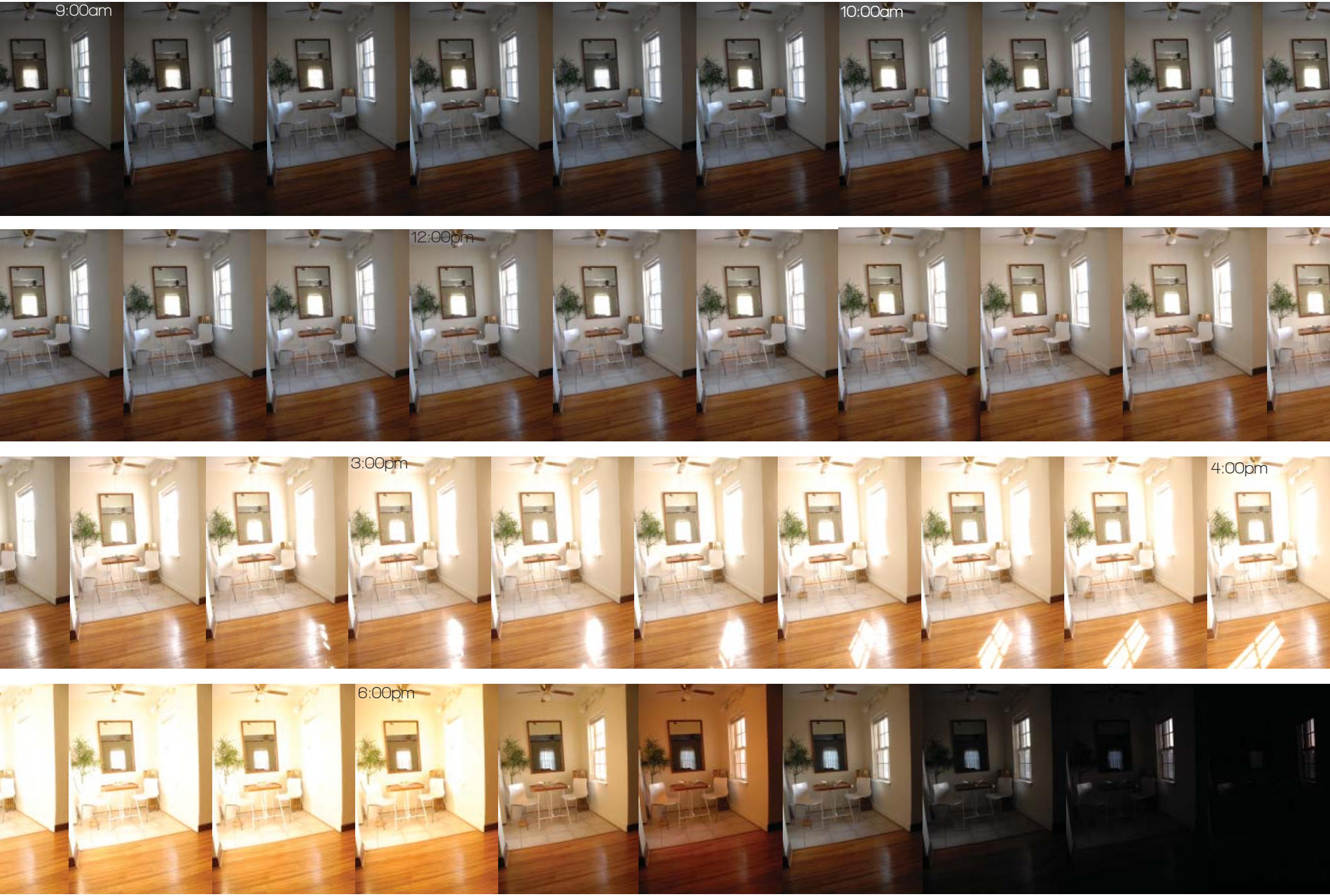
Although this seems to be a simple concept, its implications are deep and affects practically everything we see. Also, understanding and predicting where light will go and what the result will be is a necessary tool for understanding other important concepts such as reflection and refraction.

APARTMENTLIGHT

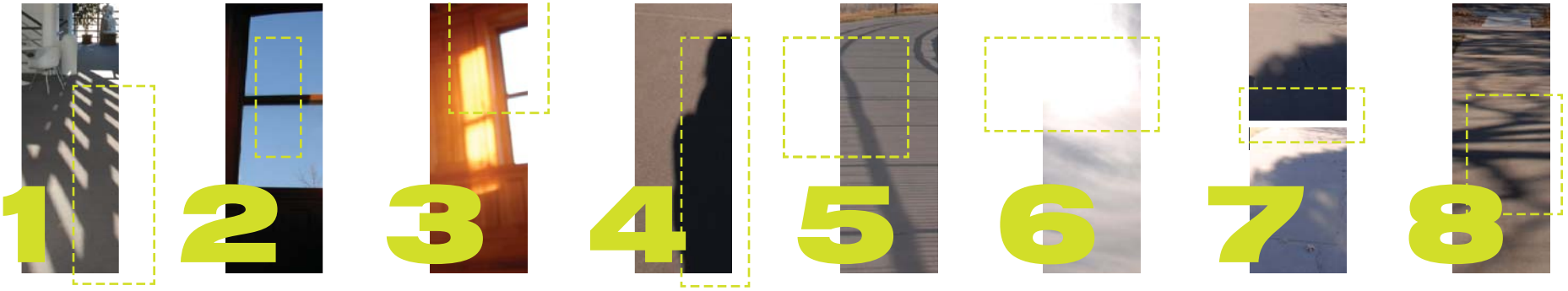
immediate space - time/season obervation






9:00am
10:00am
12:00pm
3:00pm
4:00pm
6:00pm

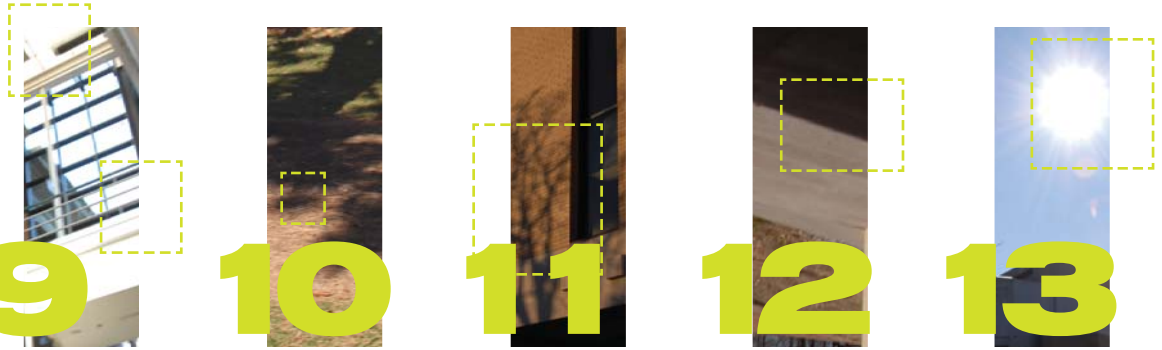
OBSERVATIONAL LIGHT STIUDY



OBSERVATIONSURVEY

light throughout the procesion of my day

1. Light takes on material-like quality
2. Dark rooms have apertures that look onto bright exteriors.
3. Angle of sun drastically alters interior lights
4. My shadow dutifully follows me around, most often unnoticed.
5. Length and direction of the shadow vary drastically from hour to hour.
6. Clouds act as a light modulater.
7. Moment to moment variability based on cloud cover.
8. Sharpness of shadows, and existence of an umbra/penumbra.
9. Light reflected and refracted onto various interior faces and planes.
10. On the ground under a tree spots of sunlight appear as round disks.
11. Trace of object that is otherwise out of the view.
12. The act of moving from outside to inside the shadow.
13. As the sun sets it becomes part of the view.



The **casting of shadows** is the ontological beginning of any **meaningful** construction or construing.

Frascari

INVESTIGATION

CHARCOAL as a medium for exploration of light, shadow and form.

The characteristic feature of charcoal as a medium that resonated with me was the ability to achieve a range of graduated tones and values as well as clean crisp edges - allowing me to recognize lights and shadows on objects, and planes in space. Representation of form and space upon a flat surface by means of light and shadow, rendered in black and white. Experiments with watercolor left me frustrated with bleeding color and soft edges.

The intensity of the application of charcoal depends upon the amount of illumination with which a desired environment interacts. Where light touches an plane or corner an edge becomes clean and discernible, whereas in shadow it appears dull, yet we know that material does not change in color. A well-defined conception of what the desired affect is, determines what the application of and addition or subtraction of the medium.

Applying this to design, if space is designed altogether in light tints or altogether in dark shades we do not utilize the entire scale of tones at our disposal, or if we do not take aspire to design spaces with the highest of light levels and with interludes of extreme darkness, or deep shadow the full limit of the available light palette has not been reached.

I've found that more or less, indoor effects of light are often softer than outdoor effects because the light rays melt into tones and overlap with one another and supplemental artificial lighting to create a more diffused shadow with lacking harsh contrast. Leonard da Vinci speaks to this in a famous maxim, "As smoke loses itself in the air, so are the lights and shadows to pass form one to the other without apparent separation."

In trying to grasp a concept as elusive yet tangible as the treatment of daylight - I will be proceeding with two complimentary medium - writing and visual representation.

Words examine idea and views, observations and analyses, about light, mood and singularity of moments, while representation present a momentary snapshot of the phenomena itself, as would be experienced by the user of the space.

With this in mind the charcoals, renderings and sketches in this book are intended not as photorealistic illustrations, but rather to form their own mode of inquisition, one that rises to the meticulously look at the metaphysical aspect of architecture in play with light, whose nuance lies, to a large extent, beyond the sphere of line drawings and diagrams.

formal charcoal study, exploring relationships of cast shadow from light cube onto light sphere., and refelcted light on dark side of sphere.

SHADOW

Everything, from a massive building to tiny pebble, has form revealed by light and shadow, regardless of its color. Light and shade make marbles round, and they also give form to a cluster of marbles as a whole. Light and shade make some parts of an object appear to come forward and other parts to recede. On the sphere, the human figure, or upon any curved surface, shadow separates from light gradually, but on angular surfaces light and shade separate abruptly.

In considering light and shade, distinction should be made between natural shade and accidental shadow. Natural shade is the shade which is inseparably connected with every object reflecting light. Accidental shadow is the shadow which one object casts upon another object by the former being interposed between the latter and the light.

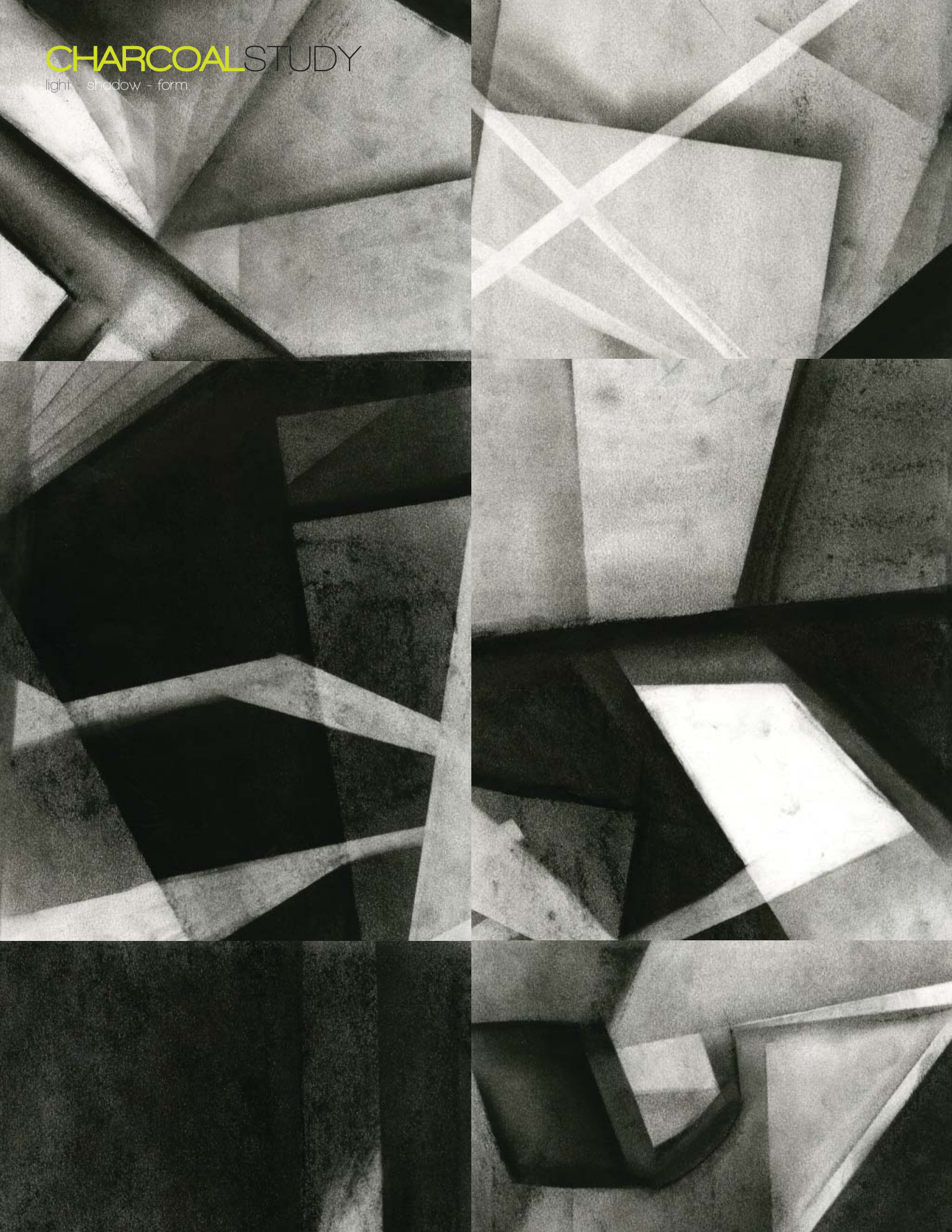
Cast shadows do not indicate the forms of the objects casting them, but conform to the surface of the one that receives them. Without the aid of the cast shadow it is often difficult to explain or comprehend a surface. Cast shadows have well-defined edges, no matter whether the objects casting them are curved or angular. All cast shadows are darkest when closest to the object casting them, and they are lightest when most distant from that object. The lights on objects receiving cast shadows appear brightest where they are in immediate contact with the darkest of these shadows.

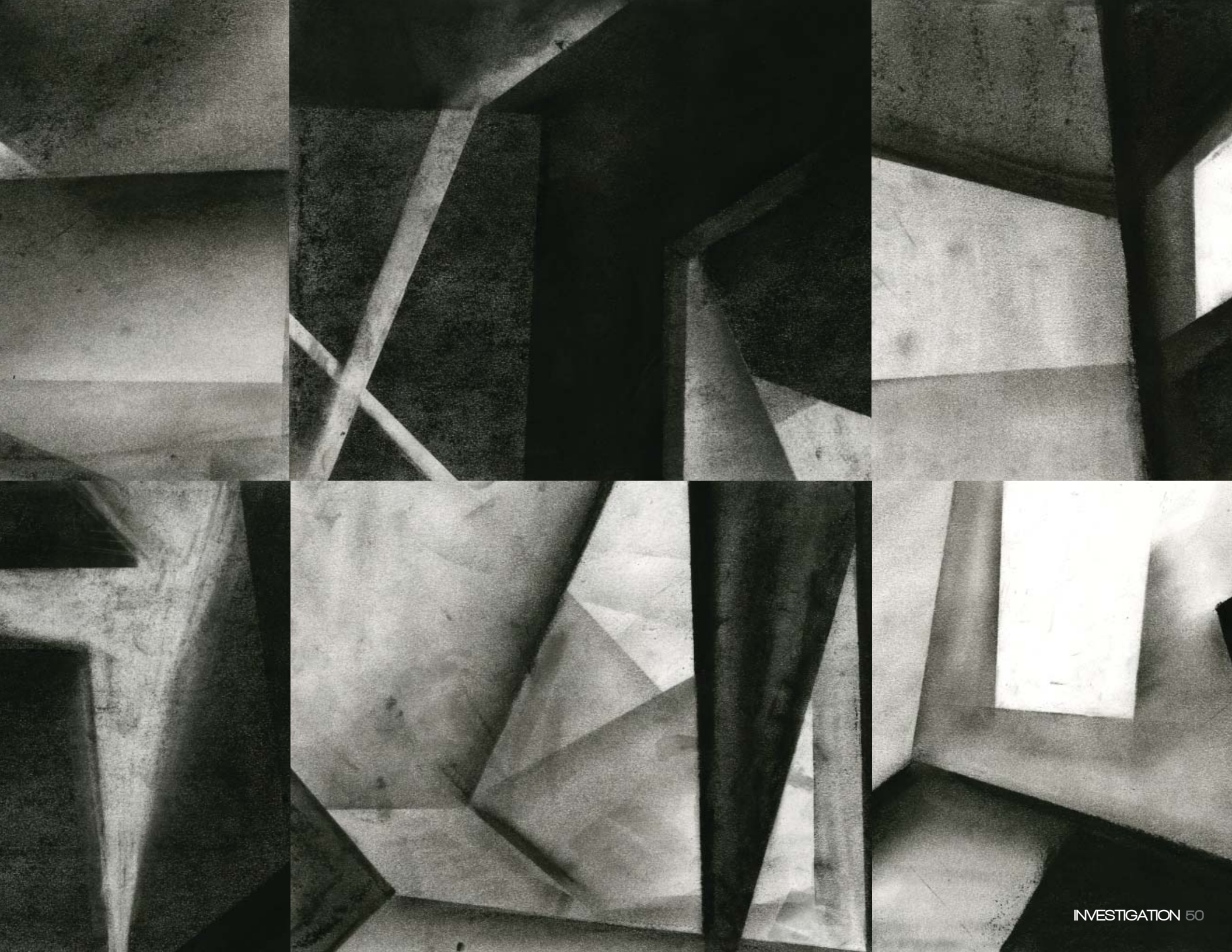
These laws apply to dark as well as to light objects, but the effects are more apparent on the light ones. The brightest light on a cylinder is at some little distance from the outline on the illuminated side, and the shade is darkest at some little distance from the outline on the shaded side. The shaded side is lightened next to the outline of a cylinder or a sphere by reflected light..

The color of an object is also influenced by the color reflected upon it from some other object. An object in direct sunlight appears lighter in color than it does indoors, and the real color of an object is more easily determined in diffused light than when illuminated by direct rays. Cast shadows out of doors are really lighter than cast shadows indoors, although they may not appear so. It is contrast creates a intense effect.

CHARCOALSTUDY

light - shadow - form





if architecture is to address the whole human person it must itself engage at some point with the idea of sacred.

Karsten Harries

ELEVATINGNORMALITY

CASE STUDY : PUBLIC BATHROOM

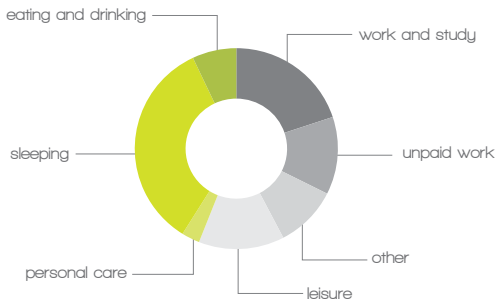
As an investigation into the potential for elevating normality - I designed a small scale urban project that is iconic and convenient - a building that accommodates the everyday, familiar, prosaic routine of daily life in a generous, dignified and provocative way.

Public bathroom was chosen as a way to explore the secular sacred outside of a religious context. Instead the program is routine. In the urban context it is a public program relating directly to the body and how the body relates to the world and the architecture specifically.

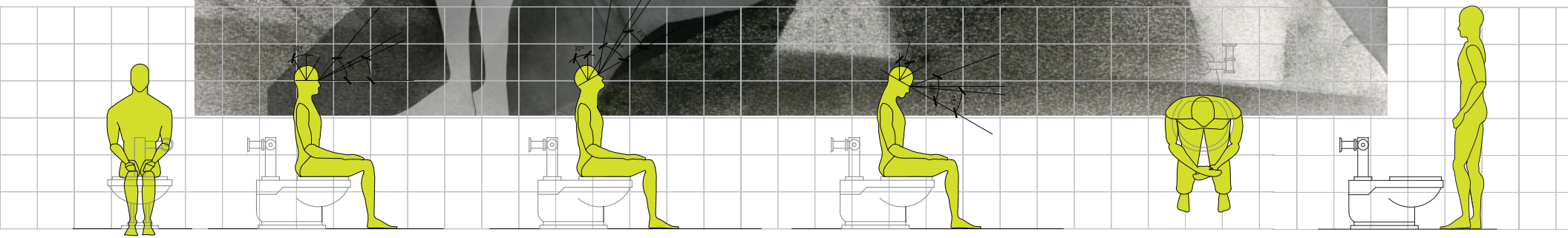
The design is not meant to (re)invent the way we urinate and cleanse, but to promote a sense of discovery and thoughtful singularity with light as a vehicle.

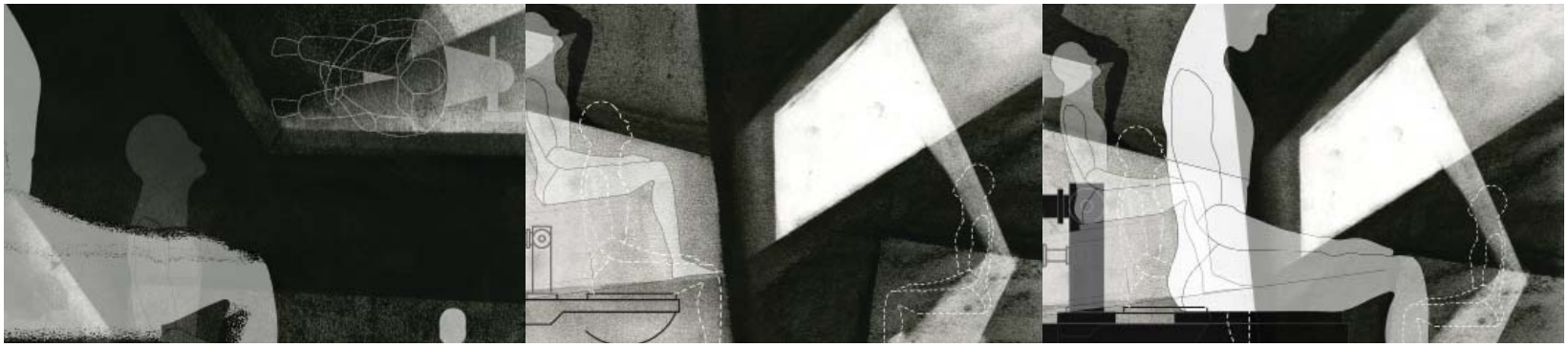
NORMALITY

primary activities - time use study
US Bureau of Labor Statistics



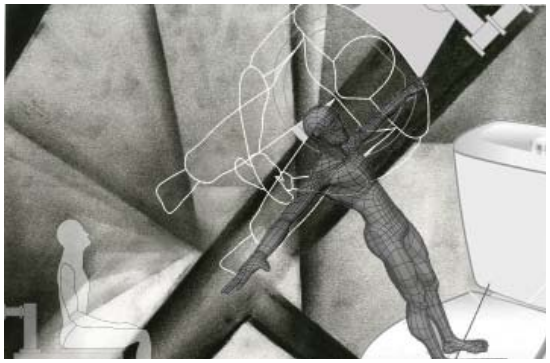
CHARCOALSREVISTED

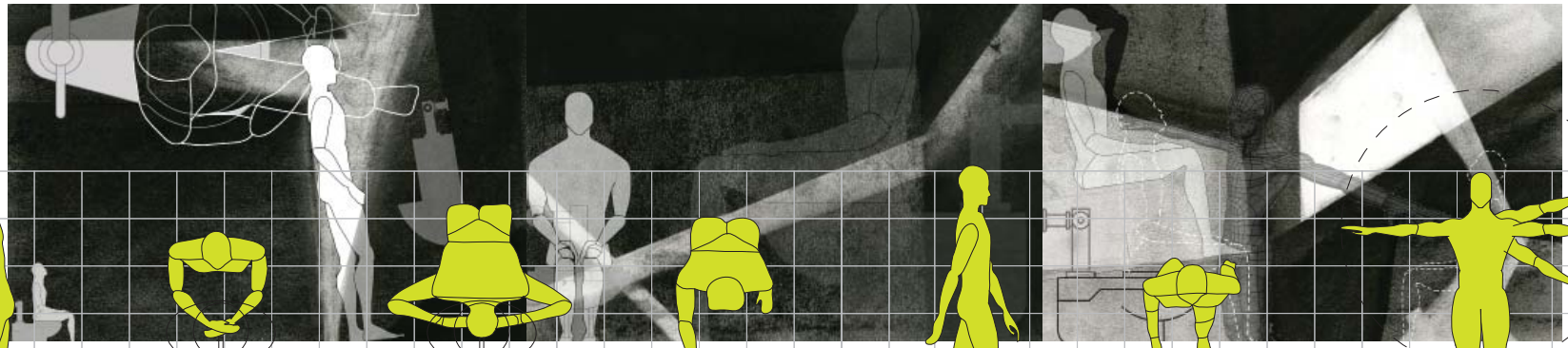




PROGRAMMATICOVERLAY

By manual collaging and digitally superimposing programmatic moments of bathroom use I was able to use my charcoal explorations to inform descried episodic lighting conditions associated with different areas of the bathroom to drive the conceptual framework for the design of my bathroom, and ultimately the placement of apertures.

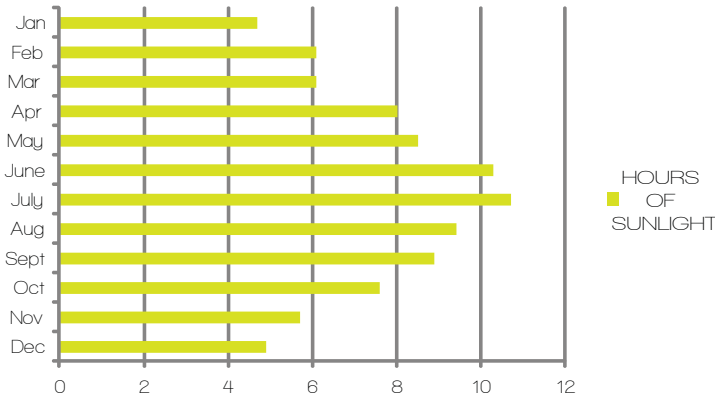




BATHROOM ANTHROPOMETICS

RELATING TO PEOPLE IN THEIR TOTALITY

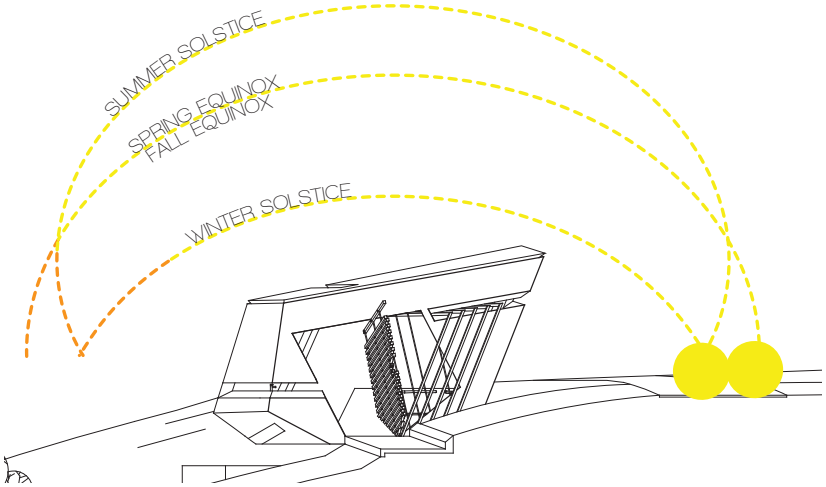
visual limits, anthropometic dimensions, optimal eye rotation, normal site lines and easy head movement.

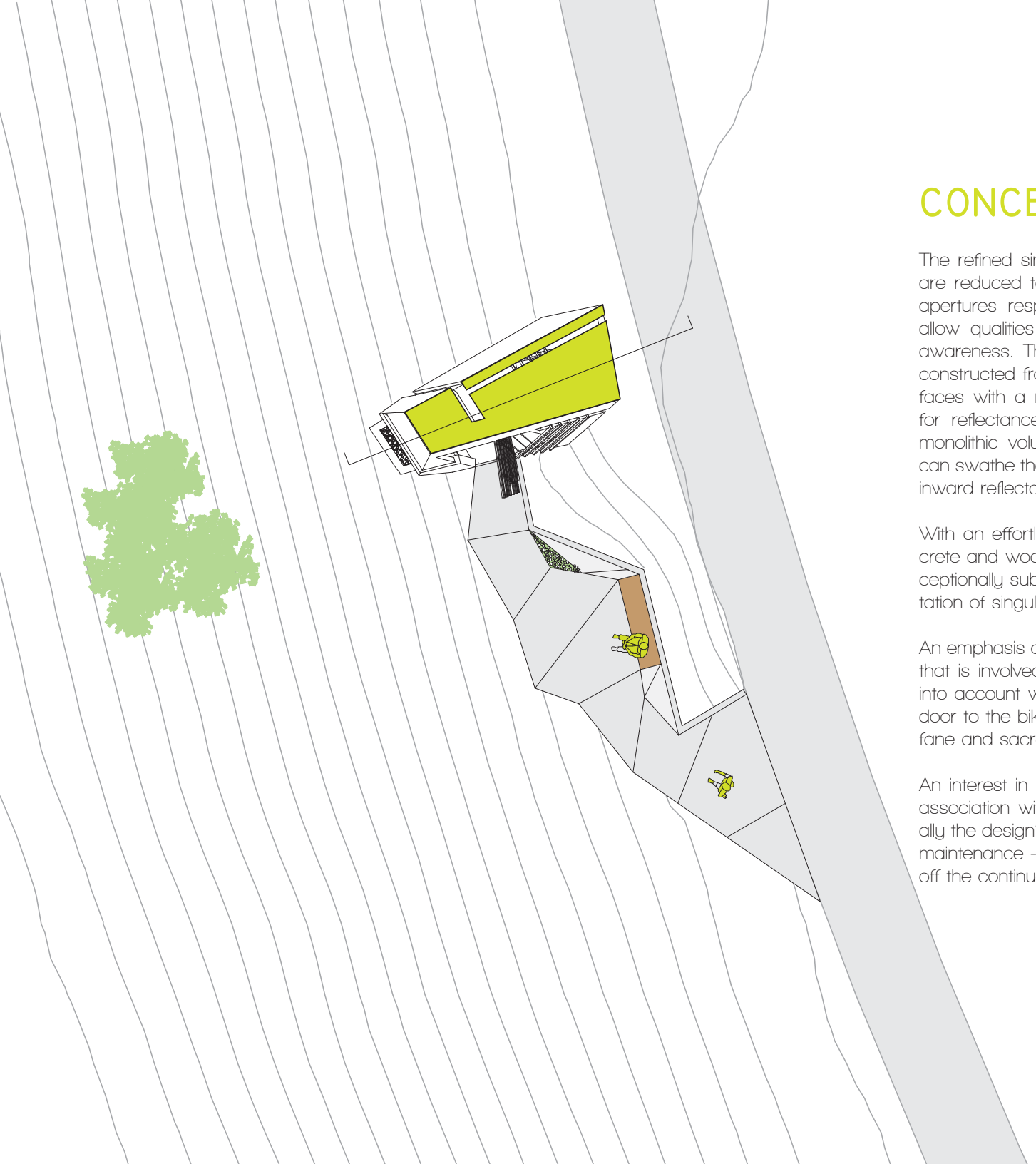


AVERAGE SUNLIGHT HOURS

There is an average range of hours of sunshine in Lincoln, Nebraska of between 4.7 hours per day in January and 10.7 hours per day in July.

On balance there are 2769 sunshine hours annually and approximately 7.6 sunlight hours for each day.





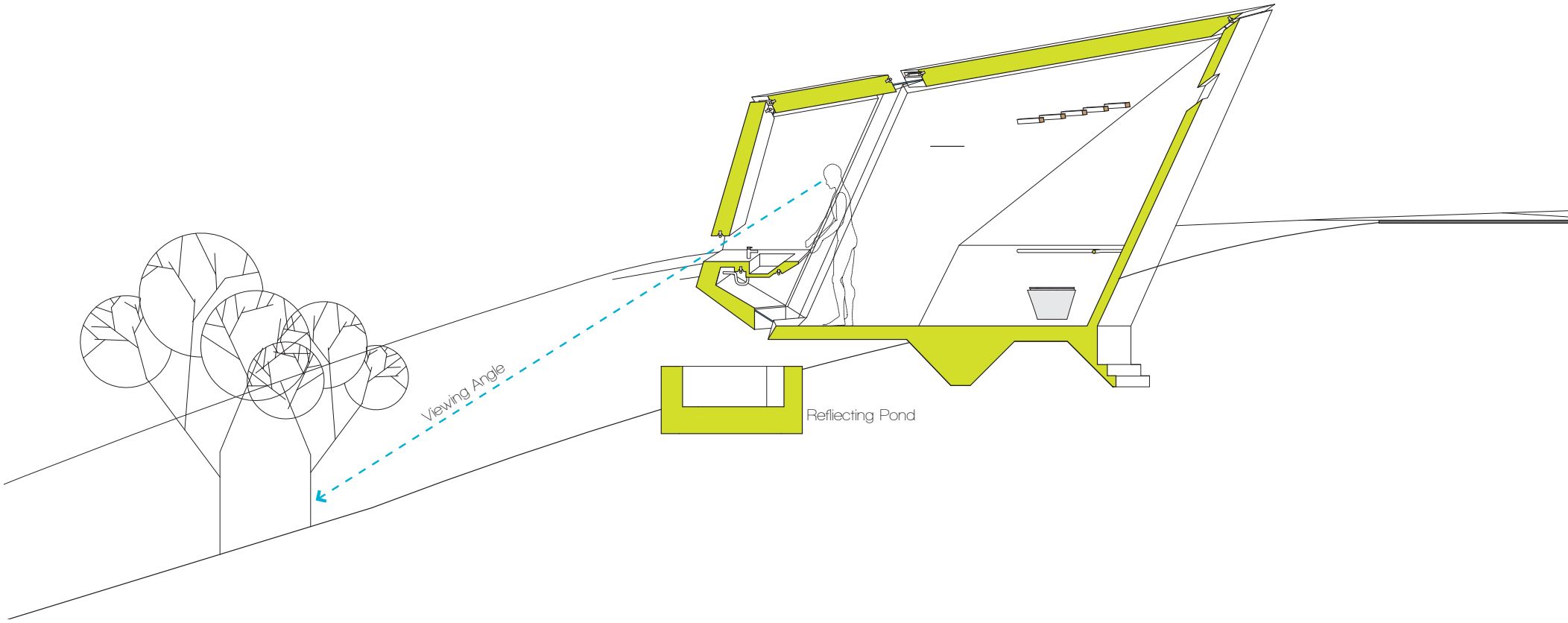
CONCEPTUALCONSTRUCT

The refined simplicity of the bathroom form, whose volumes are reduced to their bare essentials and whose angles and apertures respond to the desired direct lighting conditions, allow qualities independent of the material world to rise to awareness. The uniform texture of the simple angled walls, constructed from cast in place concrete, rough on most surfaces with a minimal reflective coating on the floor to allow for reflectance of light, and ease of cleaning, produces a monolithic volume whose cohesive play of light and shade can swathe the whole human in a deep sense of solitude and inward reflectance.

With an effortless palette of natural materials, limited to concrete and wood, the structure permits the discernment of exceptionally subtle tonalities of light - strengthening the manifestation of singularity.

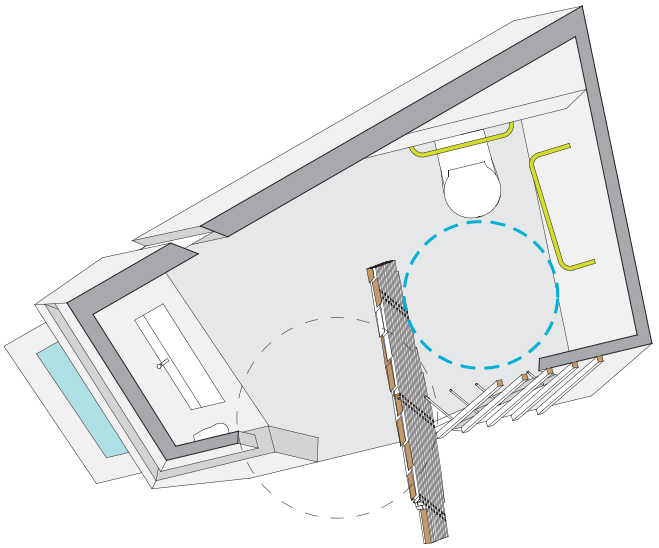
An emphasis on the idea of preparedness and the procession that is involved with the idea of the secular scared is taking into account with the site strategy - a path extends from the door to the bike path acting as a threshold between the profane and sacred.

An interest in uncomplicated walls bathed in light creates an association with physical cleanliness and hygiene - functionally the design's various apertures allow for easy cleaning and maintenance - as dust and dirt can easily be rinsed or swept off the continuous surfaces.

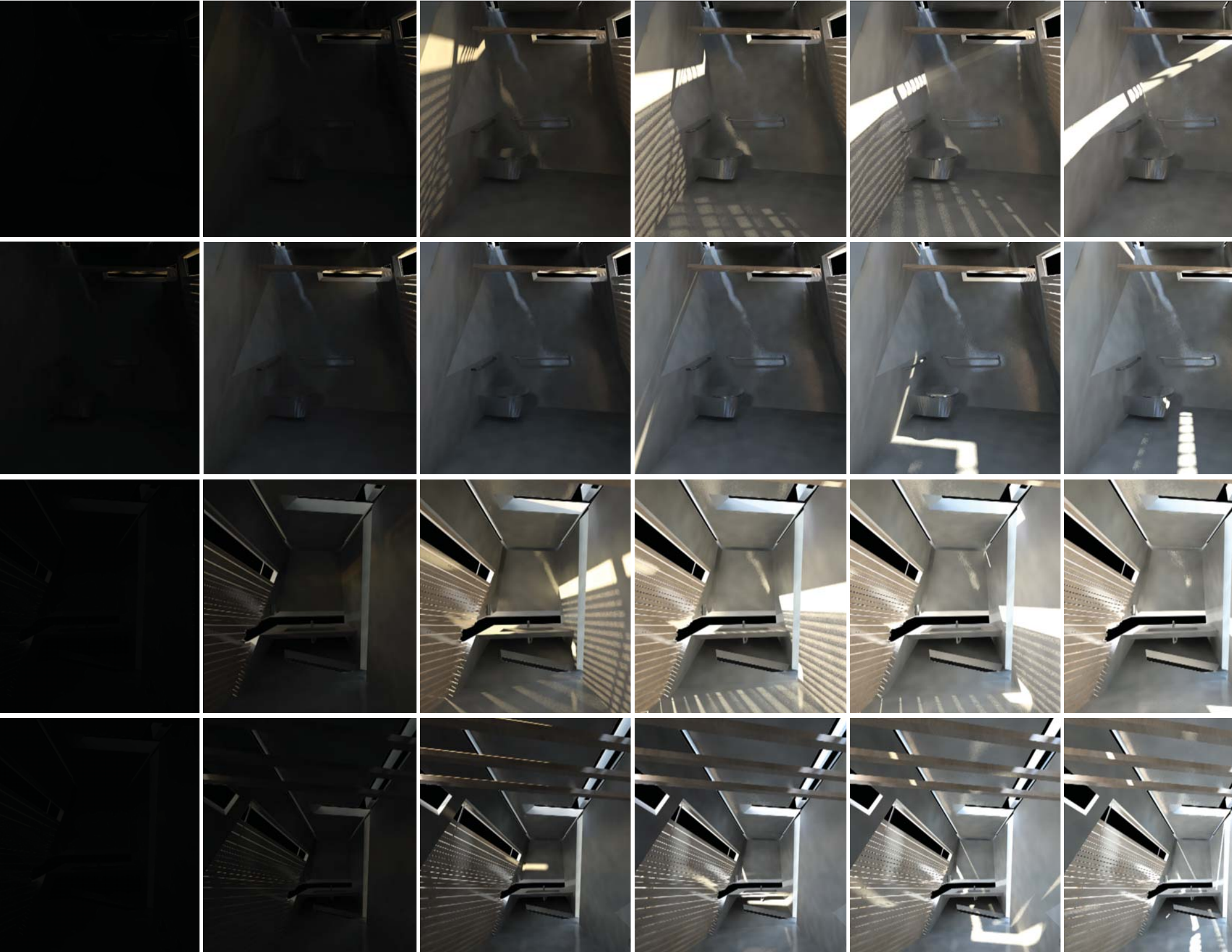


Through 'sacred light' there is a suggestion of a **timeless place** that presents us with a **revelation of an absolute reality**

Pivoting door allows for participation in the manipulation of lighting conditions - when the door is opened to enter you get a glimpse of the facilities and when the door is shut the interior lighting changes substantially.



in a secular world.



WINTERSOLSTICE

DECEMBER 22
SUNRISE 7:48am
SOLAR NOON ALTITIUDE 25.8°
SUNSET 5:02PM

SUMMERSOLSTICE

JUNE 22
SUNRISE 5:55am
SOLAR NOON ALTITIUDE
72.6°

part of our human condition is the inevitable yearning to capture reality through metaphors... architecture is poetic, necessarily an abstract order but in itself a metaphor emerging from a vision of the world and Being.

Perez Gomez

Architecture and the Crisis of Modern Science.

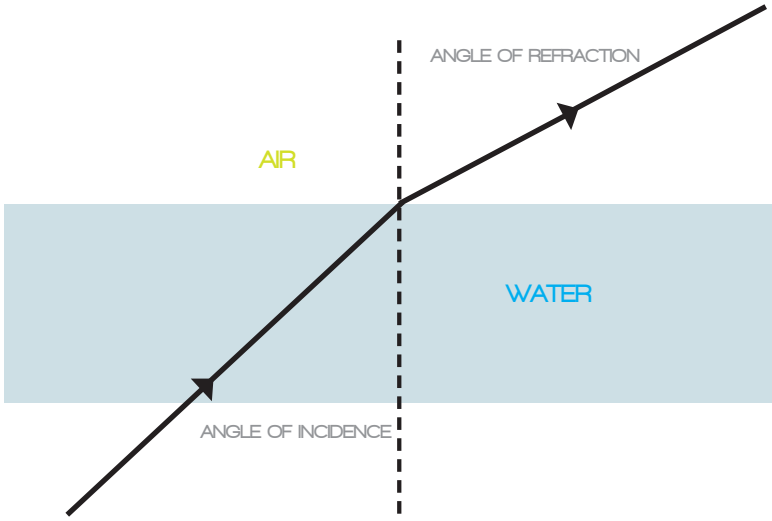
REFRACTIVESANCTUM

NATATORIUM

Further exploration was pursued through the design of a natatorium. The proposed program is a public space that seeks to explore the rich immaterial complexities of secular sacred light, communal space and the unique relationship between light and water.

The proposed complex includes a lobby, changing areas, a recreational pool, leisure pools, spas, solarium and supportive mechanical and HVAC systems. As a whole the building becomes a catalyst of discovery through the exceptional interaction of light, water and leisure- a sanctum of refraction and reflection.

The nature of the program has deliberate relation to the body and an intrinsic procession of preparing oneself for leisure activity.



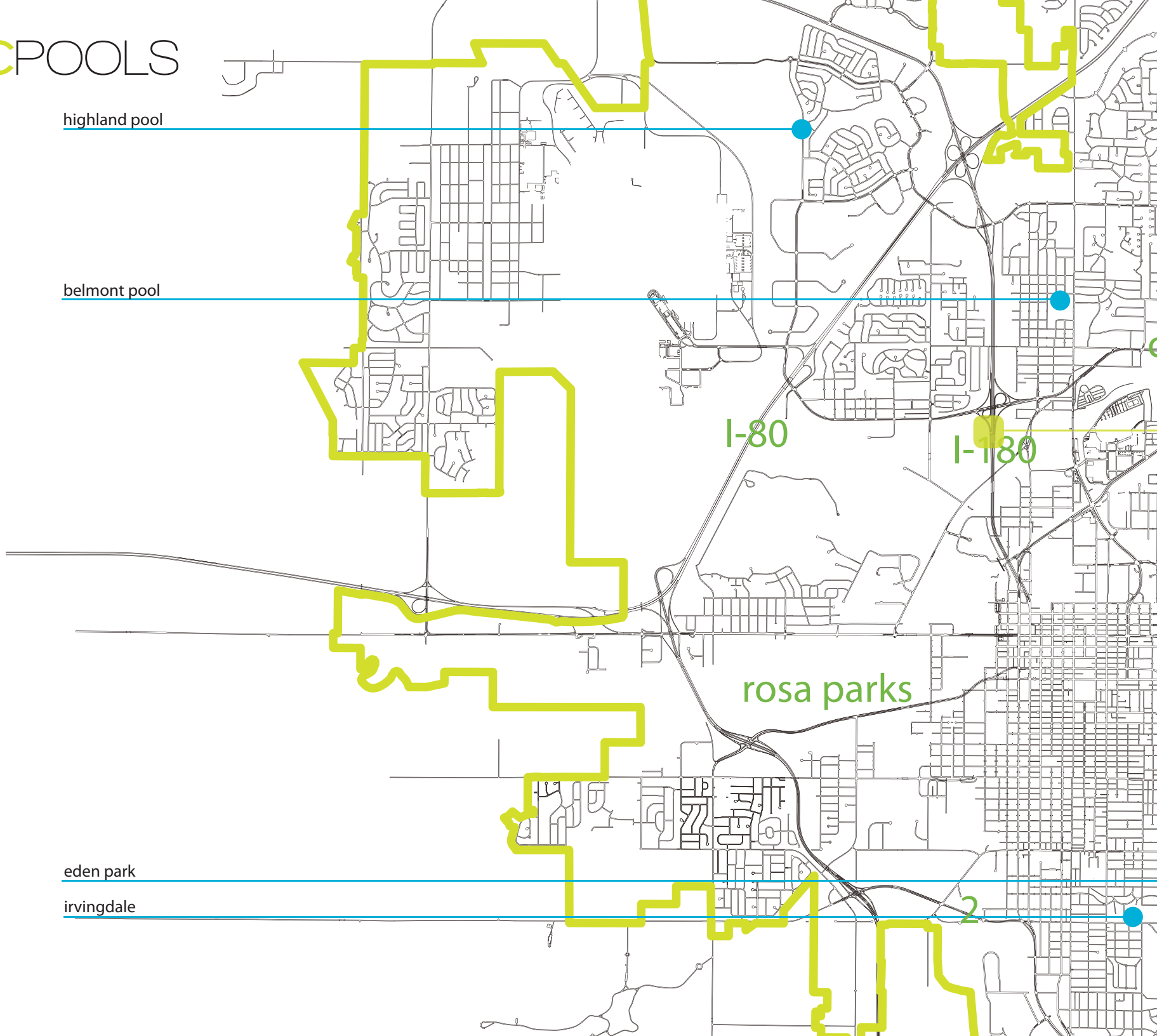
When light passes from one medium (material) to another it changes speed. This is because the speed of a wave is determined by the medium through which it is passing.

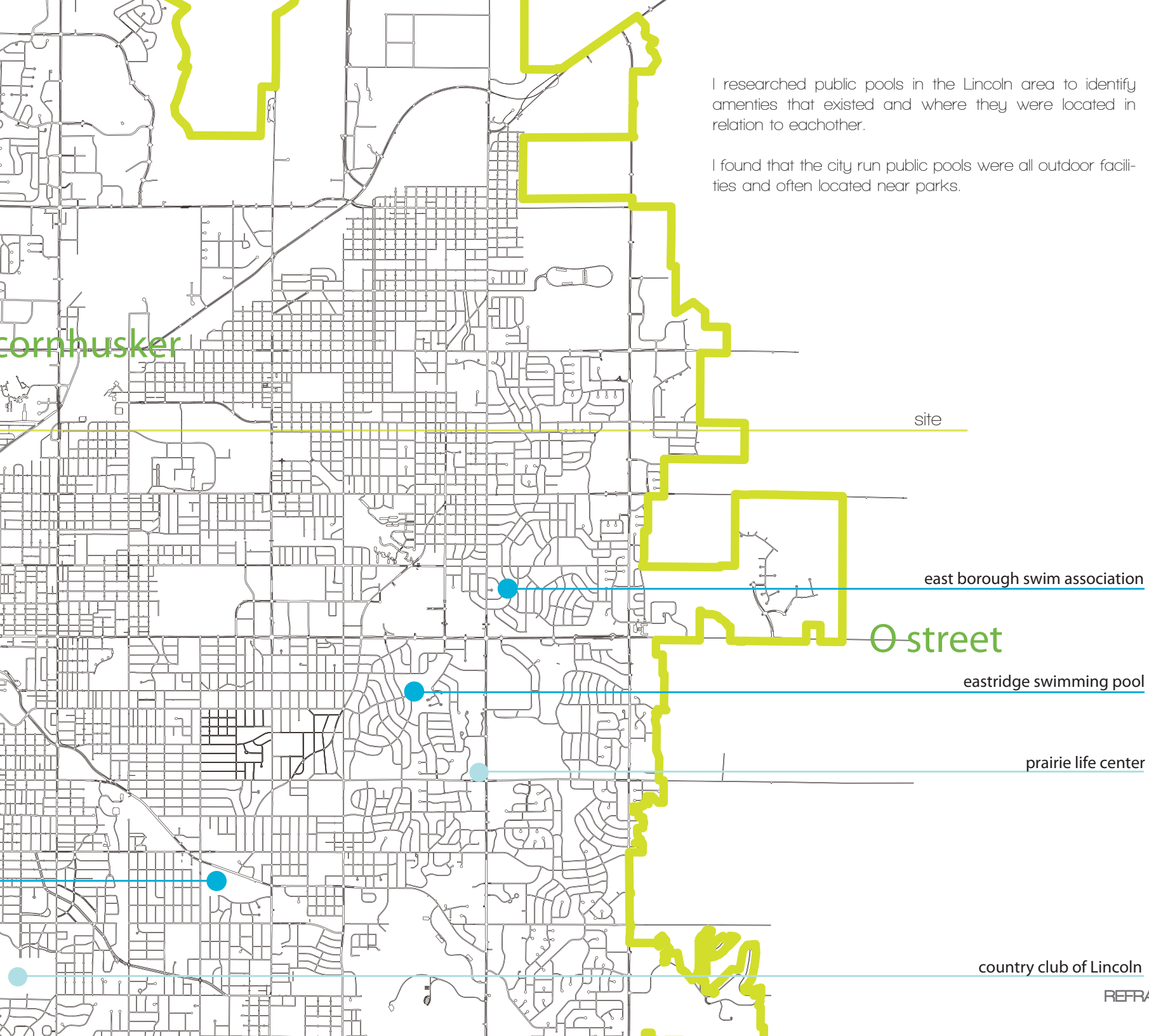
When light speeds up as it passes from one material to another, the angle of refraction is bigger than the angle of incidence.

For example, this happens when light passes from water to air or from glass to water.

PUBLICPOOLS

LINCOLN, NE





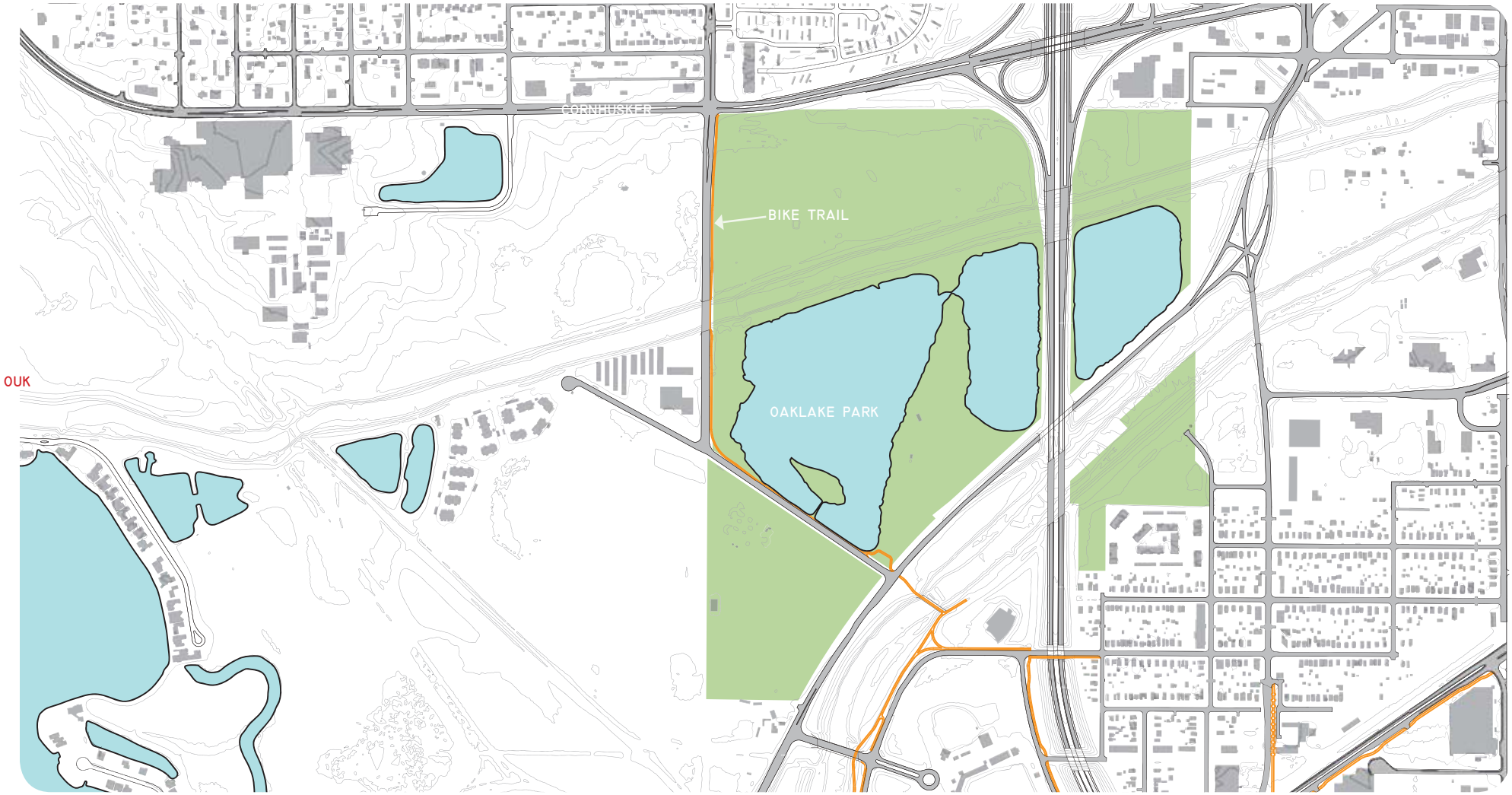
I researched public pools in the Lincoln area to identify amenties that existed and where they were located in relation to eachother.

I found that the city run public pools were all outdoor facilities and often located near parks.

SITESELECTION

OAKLAKE PARK

I chose my site based on it's distance from other pool facilities in the area as well as proximity to a major arterial highway. Oaklake is one of the cities underutilized parks and offered scenery, views of downtown, and ease of access.

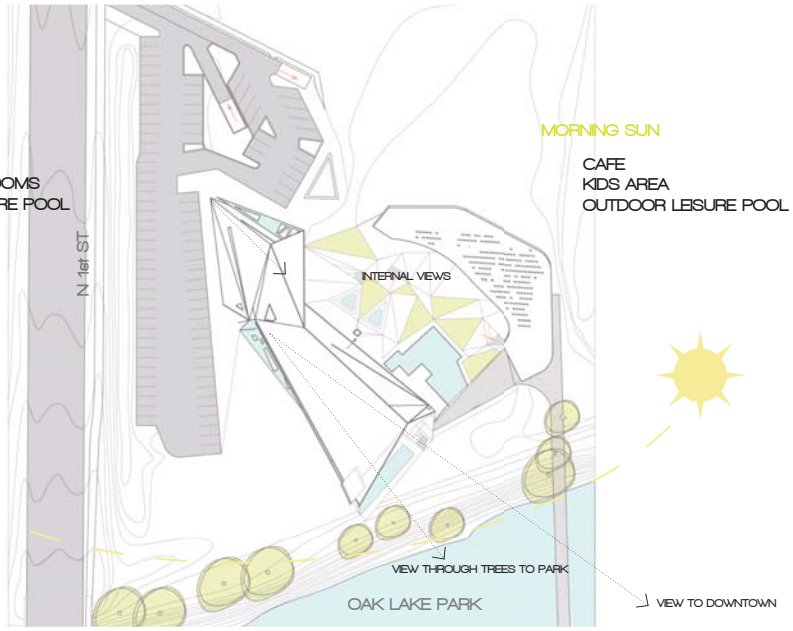


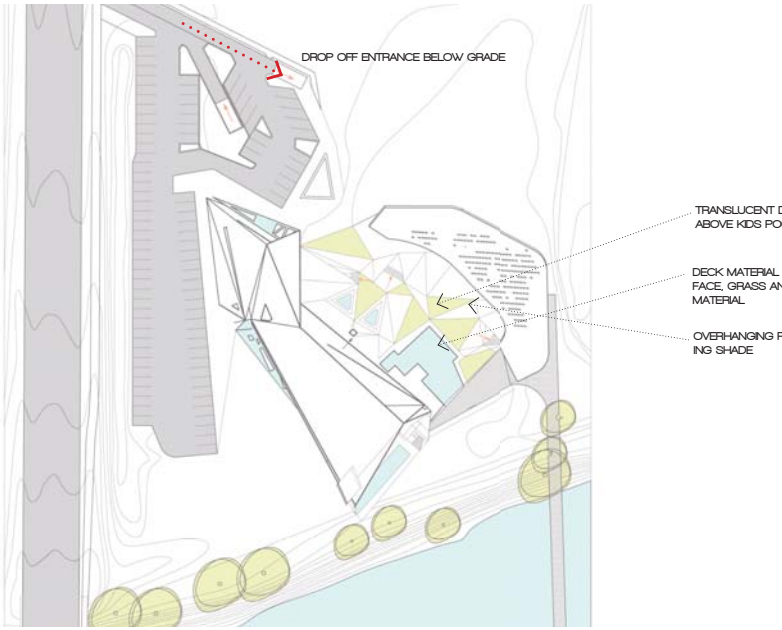
EVENING SUN

LOBBY
CHANGING ROOMS
INDOOR LEISURE POOL

MORNING SUN

CAFE
KIDS AREA
OUTDOOR LEISURE POOL

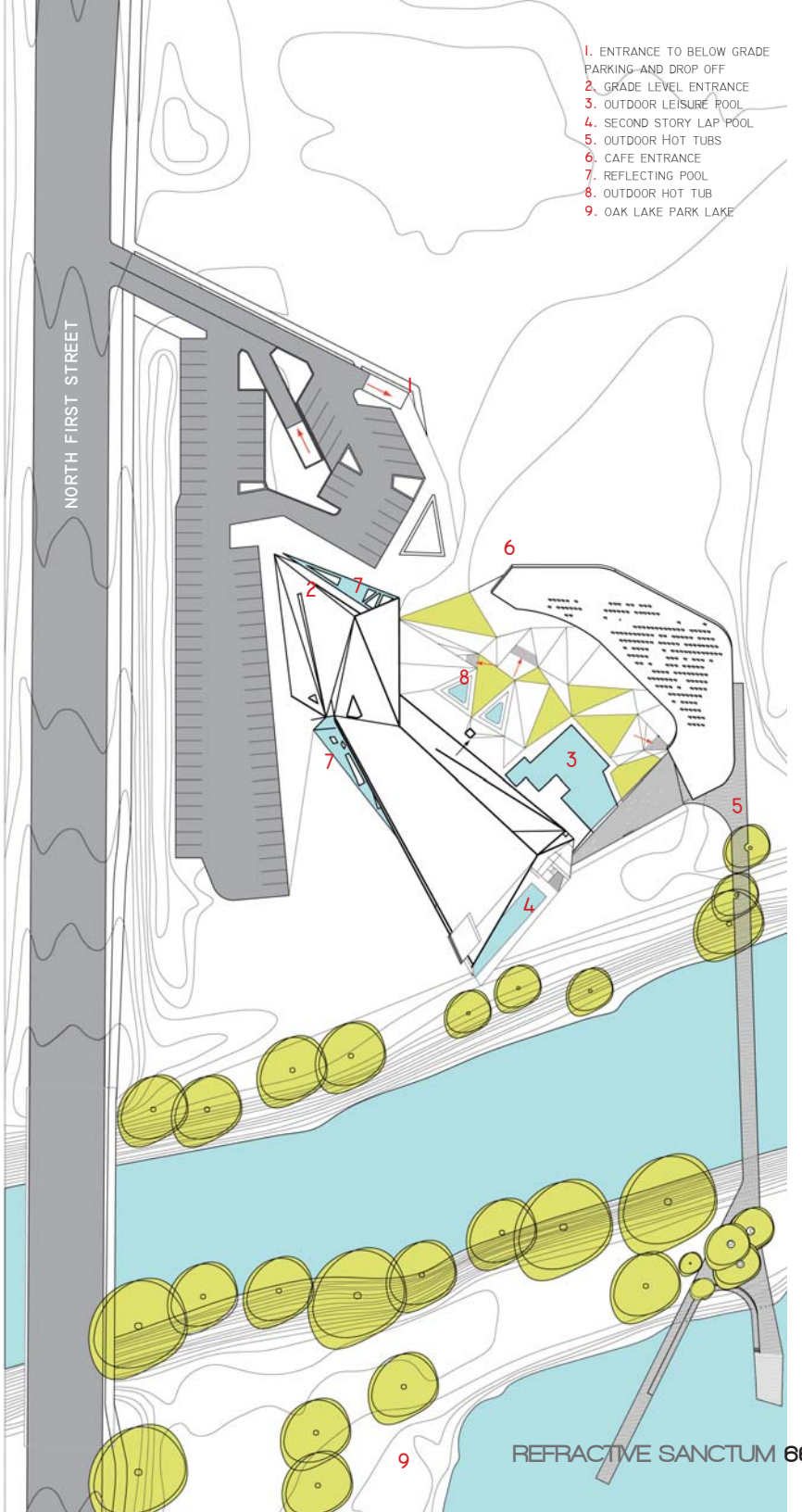




SITEPLAN

LINCOLN, NE

1. ENTRANCE TO BELOW GRADE PARKING AND DROP OFF
2. GRADE LEVEL ENTRANCE
3. OUTDOOR LEISURE POOL
4. SECOND STORY LAP POOL
5. OUTDOOR HOT TUBS
6. CAFE ENTRANCE
7. REFLECTING POOL
8. OUTDOOR HOT TUB
9. OAK LAKE PARK LAKE

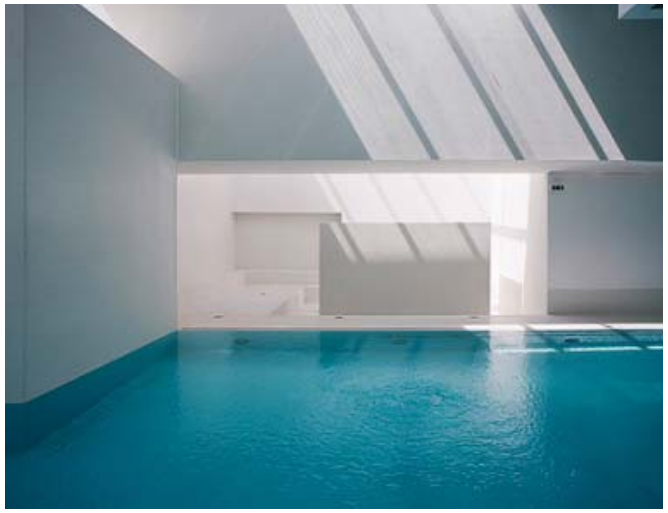


PRECEDENTNATORIUM

Williams Natatorium - Cranbrook 1999

Bloomfield Hills, MI
Tod Williams and Billie Tsien
20,000 square feet
Facilities:

-25 yard swimming pool - 8 lanes
-3'6" shallow end, and a maximum depth of 13'
-800 square feet of clear space for dry land training
-160 square feet of office space a
-Spectator seating for up to 200 individuals
-A glass observation gallery overlooking the pool and serves as an additional spectator area
-Locker facilities, 700 square feet and 36 lockers each, for male and female swimmers



Les Bains des Docks aquatic center- 2010

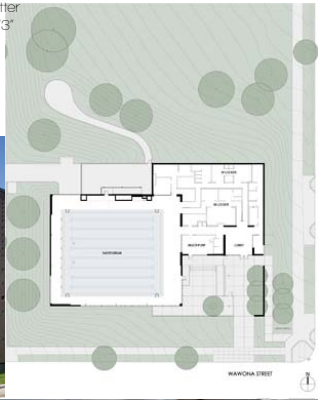
Le Havre, France
Ateliers Jean Nouvel
92,570 square feet
Facilities:

-Olympic size pool
-12 pools
-700 to 2,000 users daily
-year round indoor/outdoor use
-disinfecting-footbath threshold
-recreational pools
-an aqueous spa
-dry cardio-fitness areas
-hot and cold baths, whirlpools, sauna

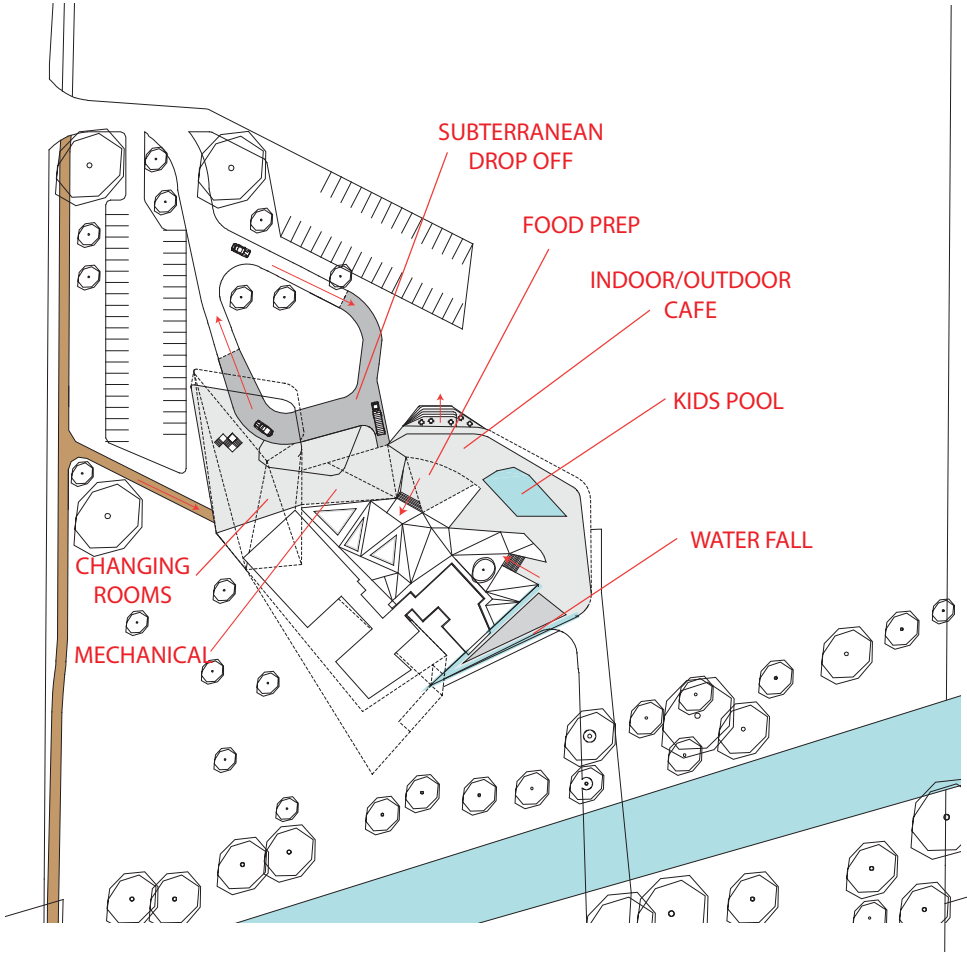
Osage Prairie Natatorium Addition

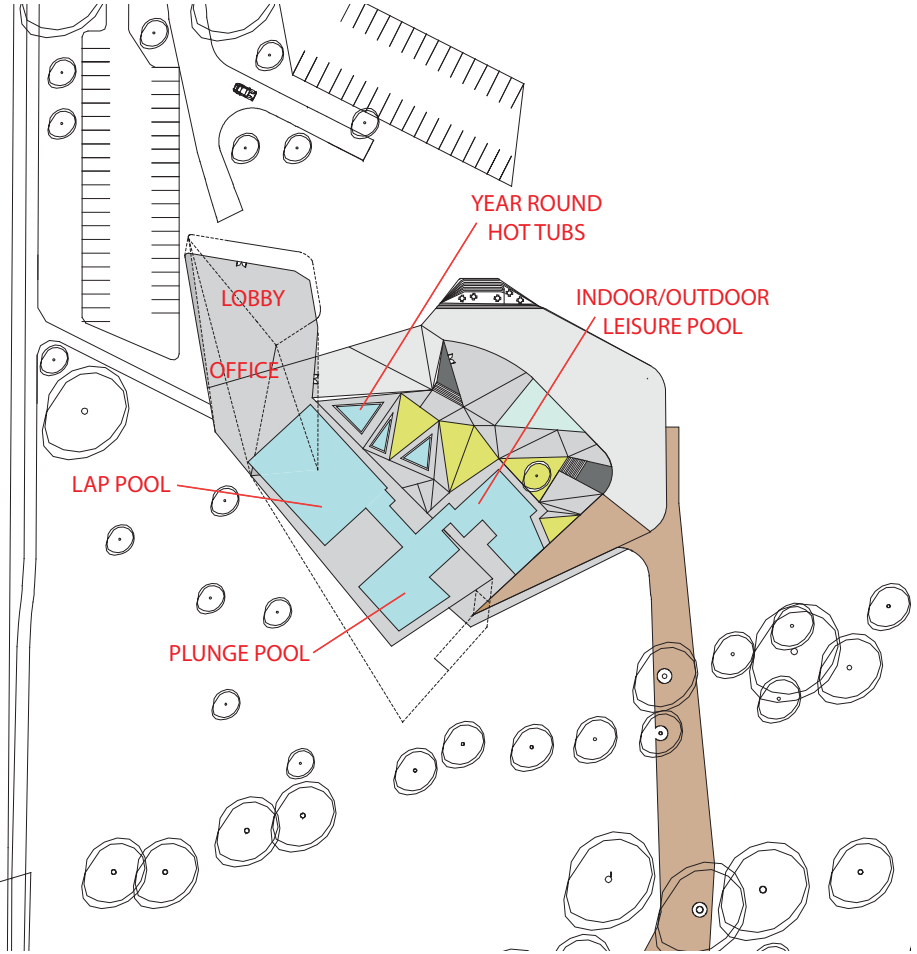
Nevada, Missouri
SFS Architecture
4200 sq. ft. within a 16,400 square feet public swimming pool
Facilities:

-A 4,725 square foot
-eight ane x 25 yard
-multipurpose pool with deck level gutter
-water depths ranging from 3'6" to 9'3"
-Aquatic Design Group



SCHEMATICDESIGN





DIAGRAMATICPROCESSION

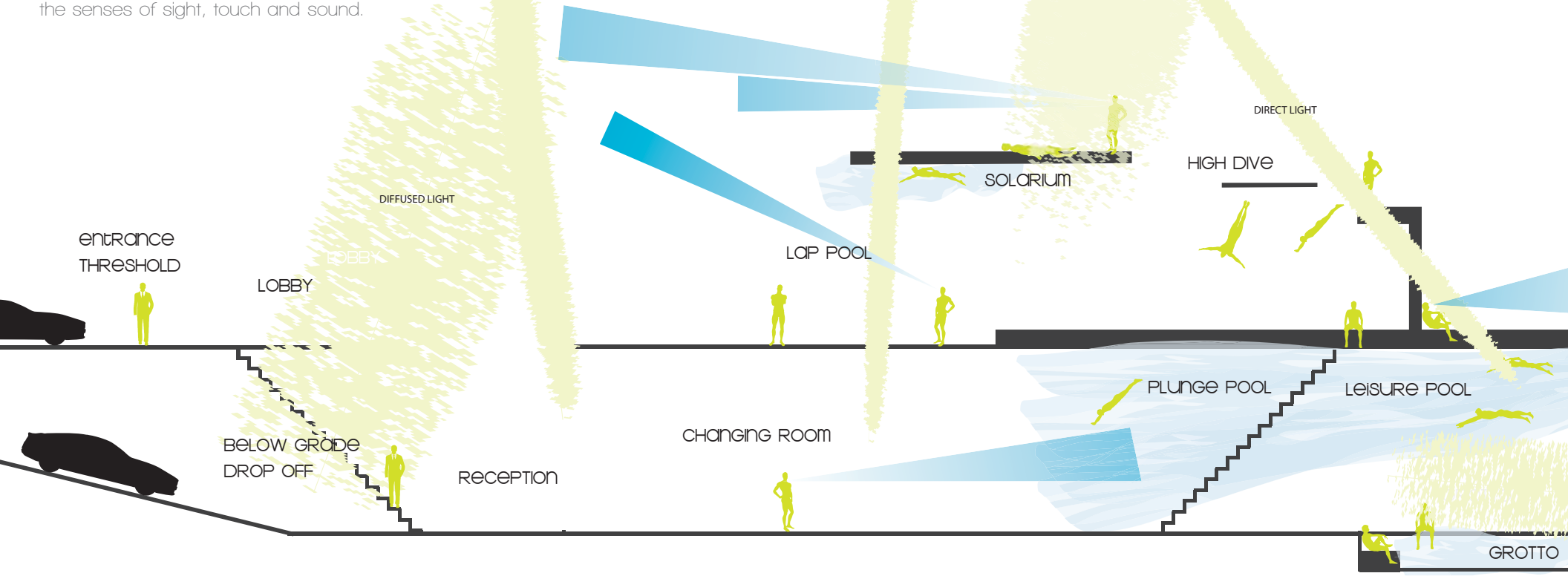
from entry threshold to exit threshold

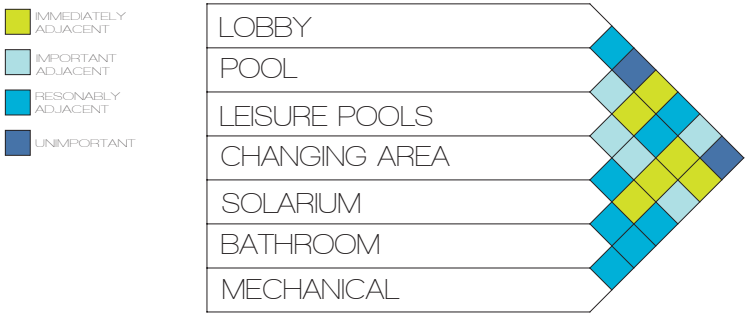
Programmatically, Natatorium offered an ideal setting in which to explore the quality and play of natural light as it alters the look and feel of habitable space. Conceptually the resultant design rests on two distinct ideas, that of procession and it's counterpoint, pause. While everyday life outside of the natatorium hums with activity, the transitory processional moments through the space offer intervals of opportunity for extreme tranquility in movement and behavior emphasized by voyage and suspension through avenues of extreme dark and extraordinary lights. The muteness of the areas associated with solitude offer mild scenes to eye, with soft gradations of light into shadow allowing a comfortable space to inhabit and pause while processional moments offer far more distinct relationships of contrasting light and dark. Highlights are brought into contact with strong darks to create a contrast of deliberate intention.

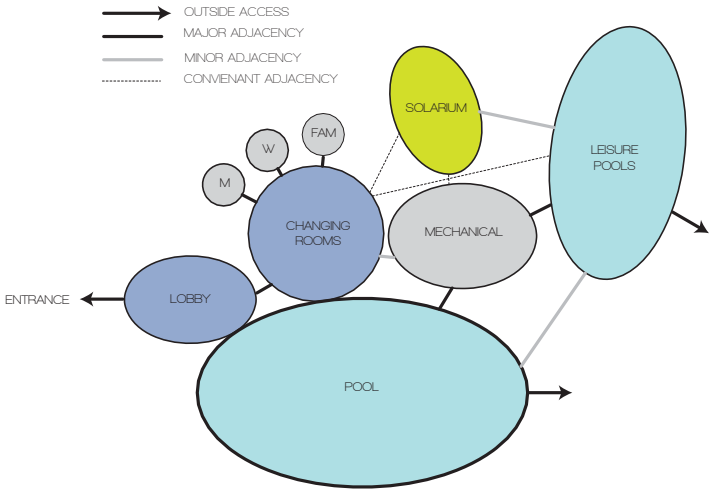
The processional moments and pauses create prospect for a movement of introversion, a turn away from the world to the depths of self - which can lead to a movement of self transcendence. Where upon the individual is cast back into her or himself imposing an identity that only engagement into the world can give it.

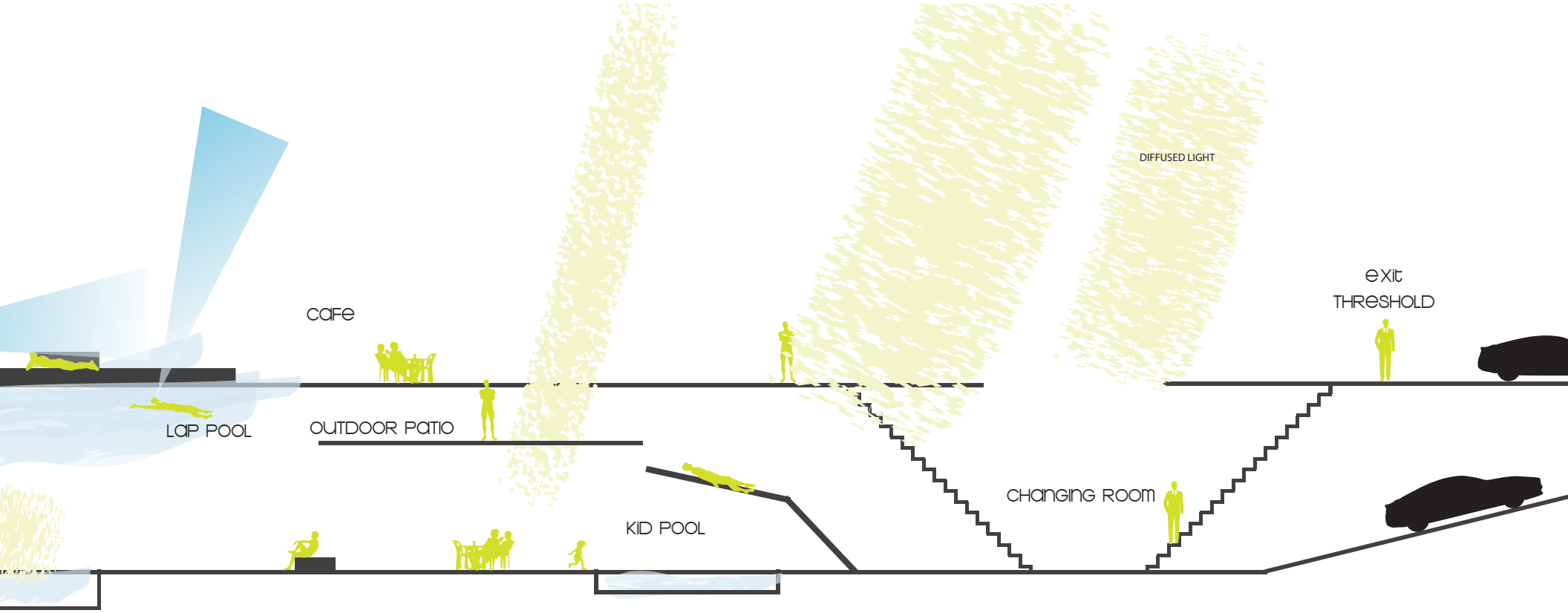
The simplification of form produced by the balance of opacity and translucency of the exterior skin serves to unite form which heightening the play of light over a facade. The monochromatic effects of the exterior skin in contrast with the translucency of the curtain walls and reflecting ponds create a sense of visual friction in areas of interest, for example the entrance to the building and the entrance to the cafe, while ranging to subtle smoothness that blends effortlessly into the landscape, in other more tranquil areas of the exterior.

Simple form in which light and shadow become the fundamental nature of the architecture creates a form of visual silence. Using continuous form, a great deal of repetition and empty planes to purify space of disorder and excess, elemental austerity allows for material to be struck by light in memorable and elusive moments. Although the previously described silence of the architectural spaces and light moments refers primarily to visual rather an tactile or acoustic properties, it reflects a close relationship between the senses of sight, touch and sound.




IMMEDIATELY ADJACENT
IMPORTANT ADJACENT
RESONABLY ADJACENT
UNIMPORTANT
LOBBY
POOL
LEISURE POOLS
CHANGING AREA
SOLARIUM
BATHROOM
MECHANICAL

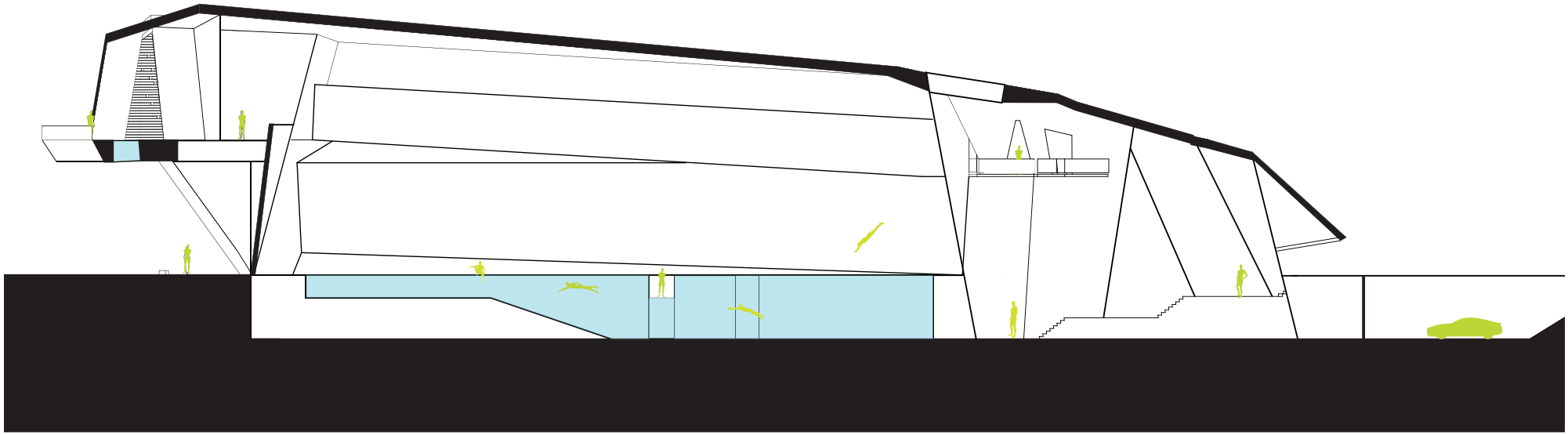

OUTSIDE ACCESS
MAJOR ADJACENCY
MINOR ADJACENCY
CONVIENANT ADJACENCY
SOLARIUM
FAM
W
M
LEISURE POOLS
CHANGING ROOMS
MECHANICAL
ENTRANCE
LOBBY
POOL


DIFFUSED LIGHT
exit
THRESHOLD
cafe
LAP POOL
OUTDOOR PATIO
KID POOL
changing room

Tinted/stained wood serves as a kind of frame to delineate from tile and stone, exaggerating it's purity and contrast. Wood used in the deck that spans the creek culminating in a deck extending over oak lake park as well as serving as the roof of the grotto reaches its utmost luminosity when coated with polyurethane creating a semi-translucent film that acts to absorb and reemit incident light, subtlety reflecting light and highlighting trace of human use.

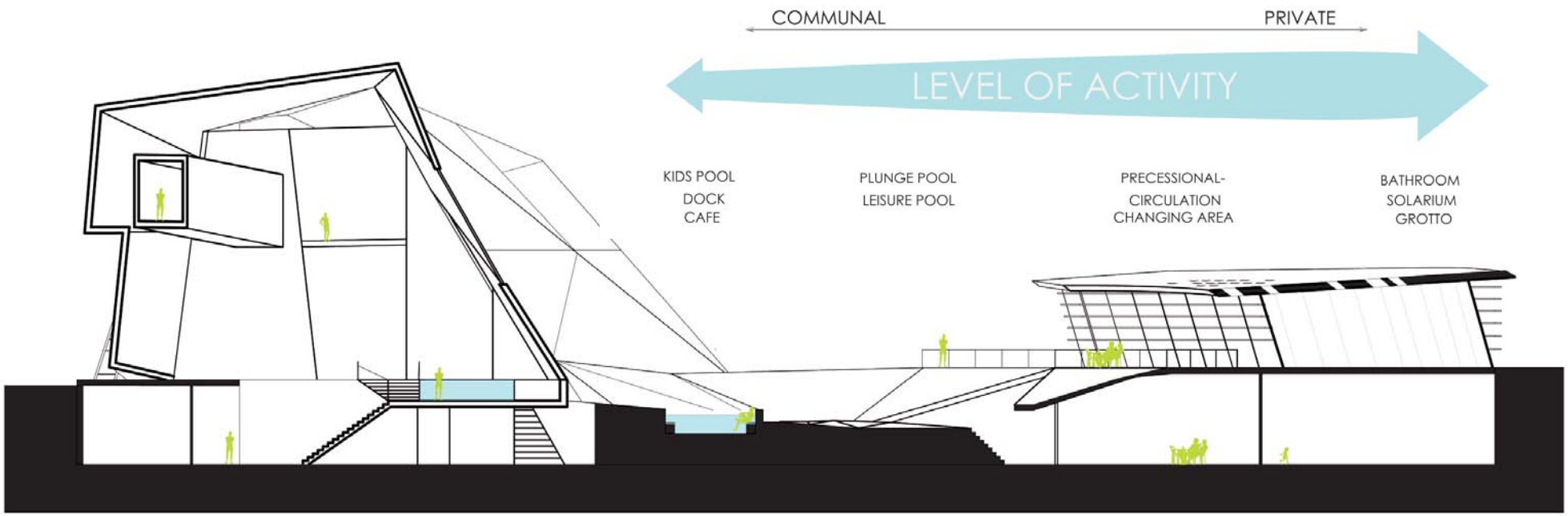
With exceptional amount of radiation captured by the main indoor pool and plunge pool space, it can be argued that although bathed with much light, the space acts as a construct of light as much as materiality.

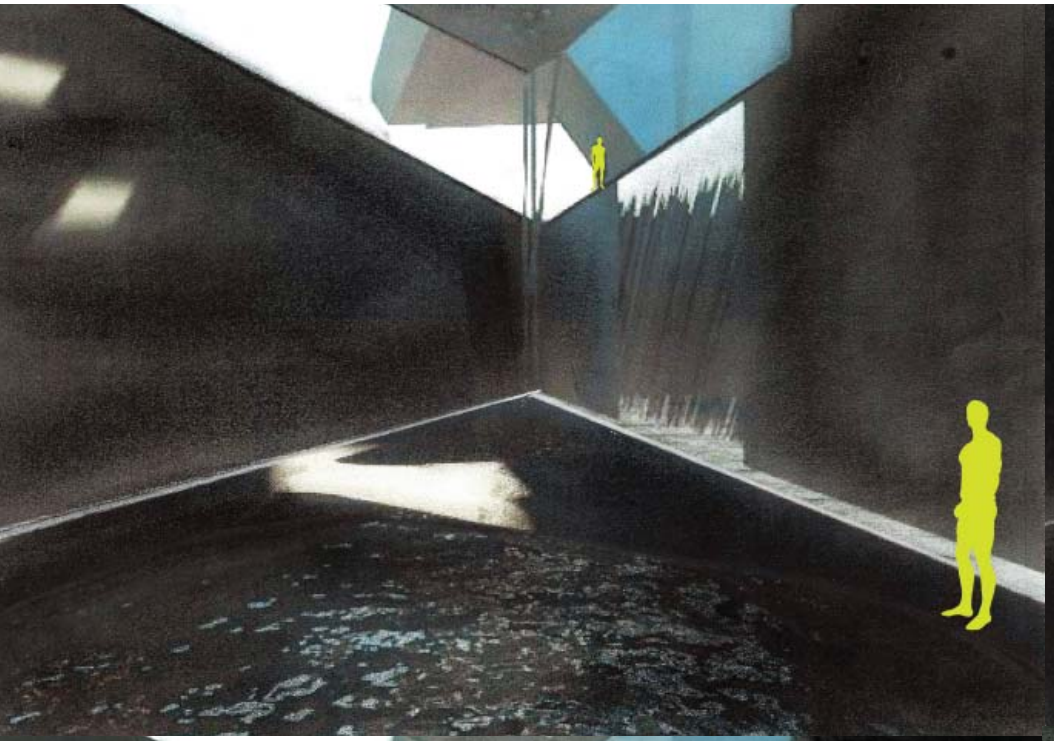
The interplay of impending facets of opaque stone cladding and large curtain walls of glass with wood screens and subtle reflections of light and water give the building a soft inner glow, which is accented by more intense light where illumination is caught with deep openings and punched apertures.

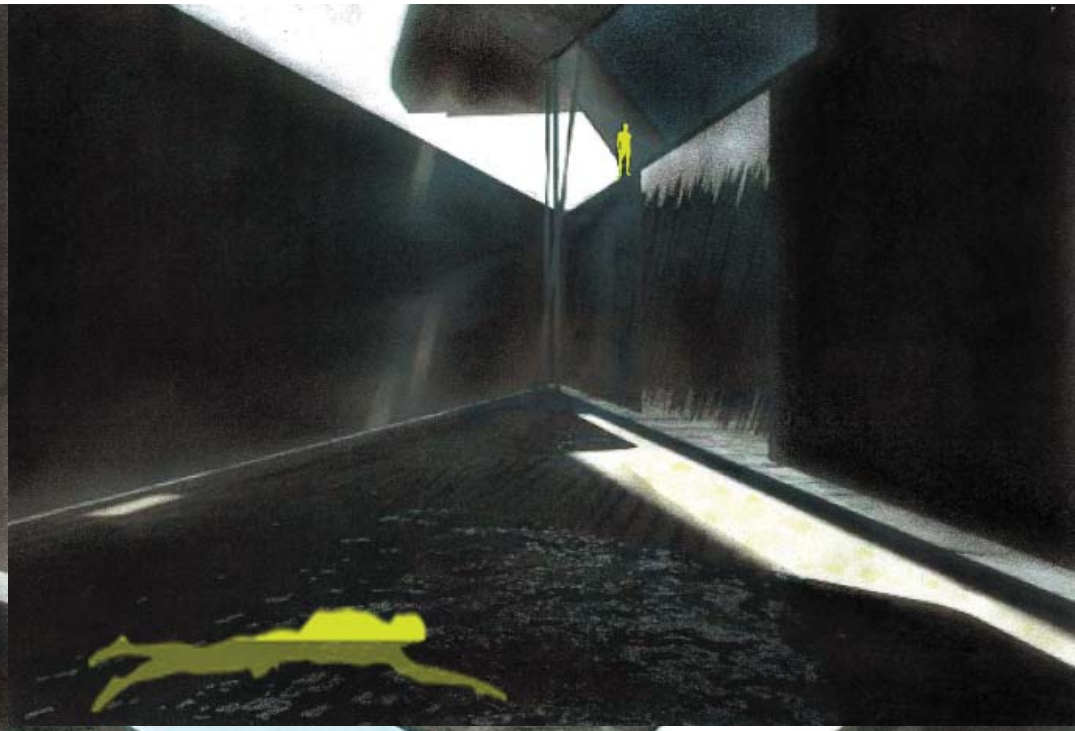


In areas of community space, visual links not only deny any sense of privacy, but also serve as visual connections to areas that are not directly accessible from the inhabited space. From the lobby to the pool, and vice versa, from the indoor pool to the outdoor leisure pools, from the lap pool to the secluded pool below, from the lap pool deck to the pool and from the high dive to the skyline and exterior leisure pools and hot tubs. Additional views connect the grotto level to the seculded patio. Visual connections offer more functional relationships as well, for example the office spaces overlook the exterior pool area and the cafe offers direct views to the kid pool as well as the exterior leisure pools and patio. The relationship of the translucent patio facets that allow for a sense of trace of human existence in exterior spaces.

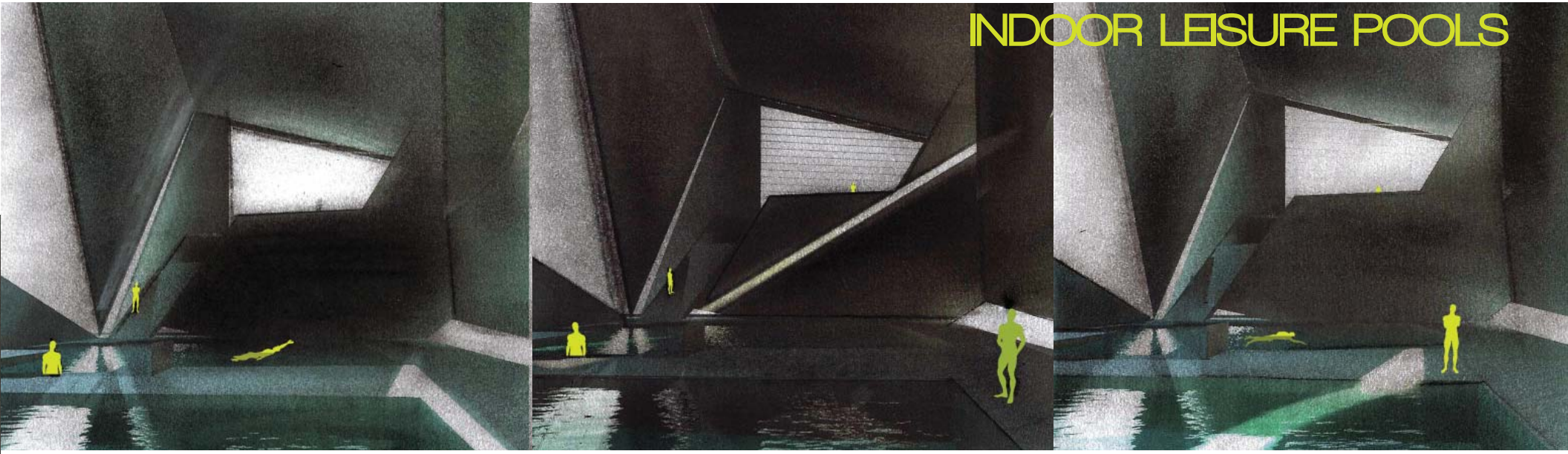
The way in which the programmatic adjacencies relate to each other, offers tranquility in areas of incidental light and further preparedness associated with secular sacred. High energy spaces, ie. the cafe and kid pool are clearly separated from areas of solitude: changing rooms, grotto and steam rooms.







GROTTO: skylight and sidelight design create patterns through the slits and larger intentional spacing of the wood planks of the deck above. Constantly shifting light through the carefully spaced decking completely transcends it's practical purpose to carry light downward into the grotto - the cavity becomes a dancing pattern of direct light and indirect light reflected from cascading waterfall and the pools below.



By heightening perception by making visible to the eye the **patterns and rhythms** that govern the cyclical nature of day to day life, perturbations, achieved that are materially static but immaterially alive, creating the secular scared dimension. I would hope that these subtle auras that dwell within and between spaces are perceivable in shifting tones as the light slips in and out of the designed space.

DESCENDING LOBBY STAIRS: smooth surfaces enhance and multiply shifting intensities of light through the day. Located on the south west side of the building this processional space with peak with light intensity in late afternoon - most likely the time of day that patrons will be arriving after working hours. The expansive, yet narrow horizontal curtain wall with its counterpoint skylight ensure that temporal effects reach every inch of the expansive decent and corresponding procession from the below grade vehicular entrance. With sun arriving in various angles from different directions - at times streaming horizontally through the glass to flood down the monolithic 30' foot walls and angle onto the a cascade of steps with extended landing pads. In the early morning and late evening, long beams of sun pierce deeply into the programmatic voids.

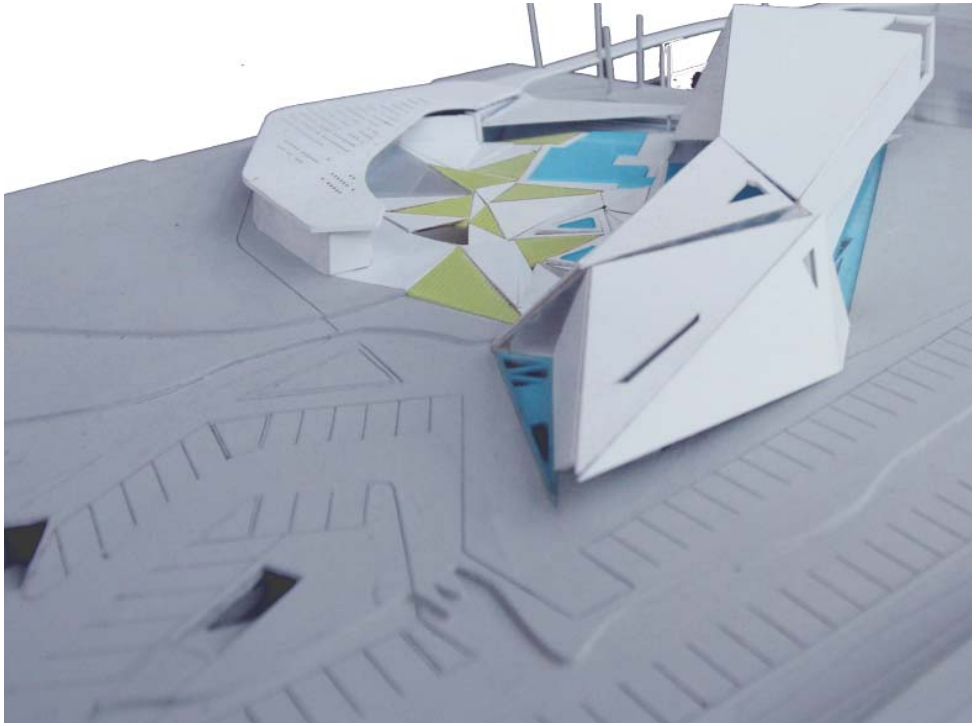
RECEPTION: highlights of more intense light caught by deep openings are produced with thick punches through the exterior facade - where reveals appear to delay some of the rays passing through, concentrating them inside a void carved from the angled faceted structure and subsequent stone skin.

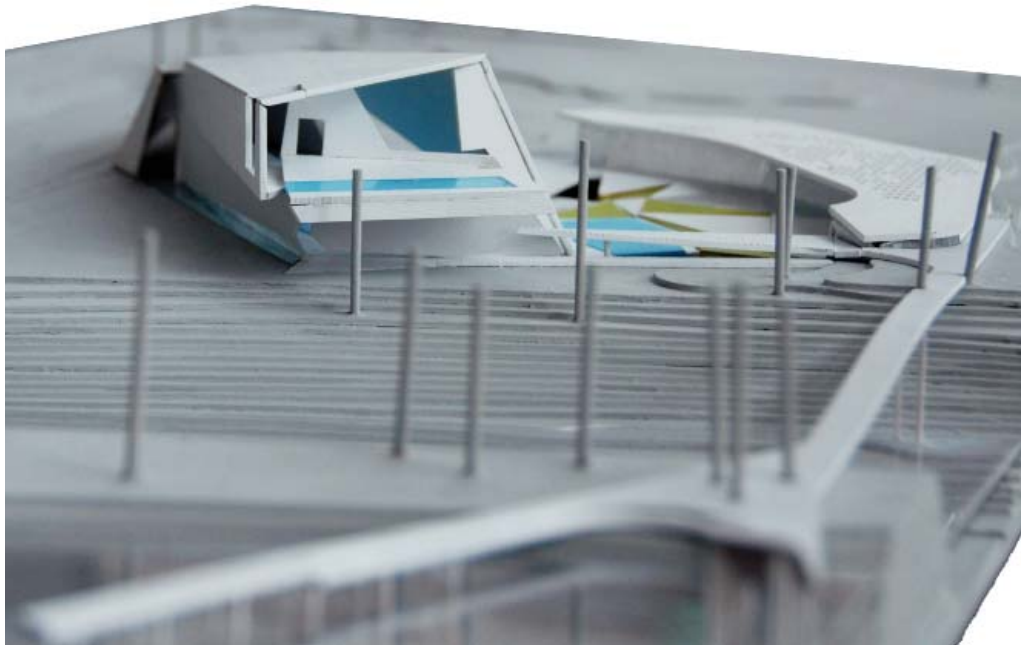
SOLARIUM: bathed with light from a glass ceiling and glass southern facing the wall the solarium offers a tranquil space to enjoy the radiant heat of the natural light. Condensation on the glass from the extreme temperatures within the solarium create a natural filter through which the direct and ambient light must pass - creating a diffused and speckled pattern of light. In the early morning and late evening, long beams of sun pierce deeply into the programmatic voids.

INTO CHANGING ROOMS: gathering extra light, while giving a distinct pattern that can only be achieved with the relationship shared by light and water, are slivers cut into the bottoms of the exterior reflecting ponds that flank the south side of the main natatorium space and the grade level entrance into the vast lobby space. These slivers serve as sky lights into the subterranean vehicular entrance and as a light at the end of the processional labyrinth into the below grade changing rooms.

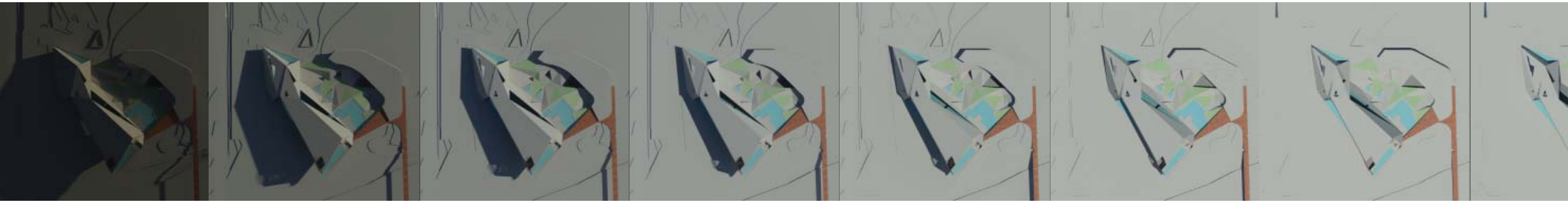
PROCESSOIN FROM CHANGING ROOM TO POOL: Borrowed light from the main natatorium space cascades down the stairs to the below grade changing areas, beckoning users to ascend into the humid air and more ambient lit natatorium pool area.

KIDS POOL: kids pool, apertures allow for direct light to render an pattern that dances across the space over the course of the day, continually ricocheting from one reflective plane to another.

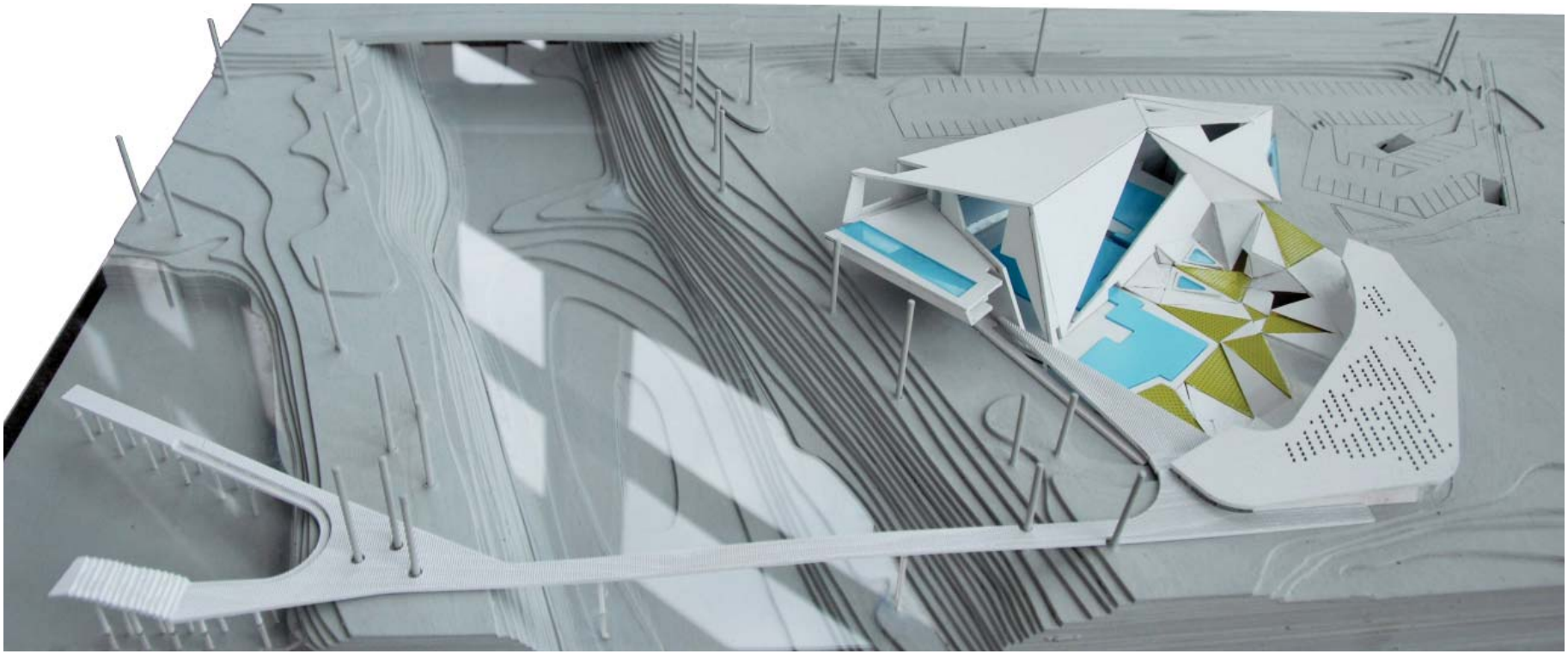


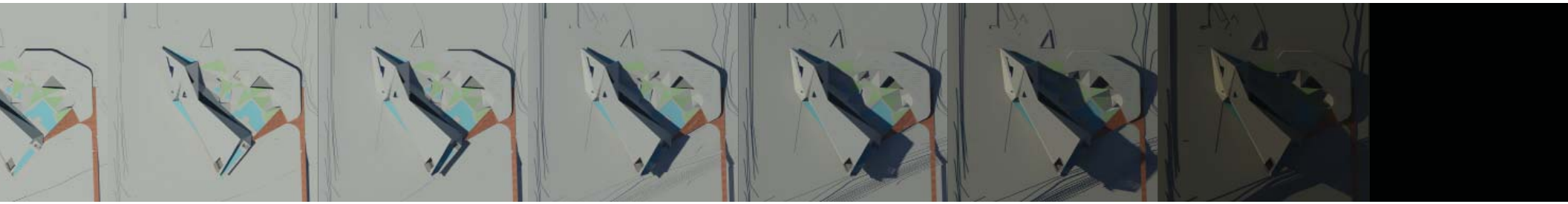


SUMMERSOLSTICE



WINTERSOLSTICE





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There is a need for a deeper sensibility for light's role in design as it relates to understanding people in their totality.